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Biological and physical data were collected from four bendways within the river portion of the Tennessee-Tombigbee Waterway (TTW) from Columbus, Mississippi, to Demopolis, Alabama: Rattlesnake Bend, Cooks Bend, Big Creek Bendway, and Hairston Bend. During this study, the four bendways had not all been cut off and had been impounded for varying lengths of time. At the completion of the TTW project, all four of the bendways will be severed from the main navigation channel. Four distinct areas within each bendway were compared: above the bendway; within the bendway; below the bendway; and within the cut.

Sampling was conducted from January 1979 to September 1980 to coincide with four different river stage/water temperature regimes: late fall-moderate flow/decreasing water temperature; winter-high flow/low temperature; spring-high flow/rising temperatures; and summer-low flow/warm water temperatures with increased probability of thermal stratification.

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20. ABSTRACT (Continued).

Data were collected for numerous physical and water quality parameters, phytoplankton and chlorophyll, benthic macroinvertebrates, and fishes. During early September 1980 a mollusk and aquatic macrophyte survey was conducted at all four bendways. The U. S. Army Engineer District, Mobile, provided data on substrate composition and bottom profiles.

Sediment analysis and bottom profiles indicated that the substrate composition of some of the bendways is changing. Overall, the substrate of the study area is changing from a sand-gravel-fines mixture to one of predominantly sand and fines. Areas of some bendways, in particular the upper areas, were accumulating sediments. At big Creek Bendway, this accumulation completely blocked water exchange between the river and the within-bendway areas.

Few significant differences in water quality were documented for either within individual bendways or among the four bendways. Only at Big Creek Bendway were consistent differences found between within-bendway samples and river samples.

Phytoplankton composition and chlorophyll concentrations showed only small differences among bendways.

Aquatic macrophytes were scattered and uncommon in the four bendways. Water-willow (Justicia sp.) was most commonly encountered, particularly in Rattlesnake Bend where numerous small beds were found.

Based upon total collections, a consistent family assemblage of macroinvertebrates characterized the four bendways. Although 60 family-level taxa were collected, nine families of macroinvertebrates accounted for between 93.5 and 97.2 percent of the benthos. The importance of these families varied among bendways and appeared to reflect differences in physical bendway conditions, particularly substrate type and current velocities.

Similarity indices indicated that the benthic communities of the four bendways were qualitatively very similar; they became less similar with increasing river-mile separation. Quantitatively, differences appeared to be due to shifts in dominance of the nine most common families associated with date of bendway cutoff.

Eighteen species of Unionid mollusks, plus the Asian clam Corbicula, were collected during the surveys. Nearly all the specimens were found at Big Creek Bendway; none were collected at Hairston Bend. With the exception of three species of Pleurobema, no unusual or uncommon mollusk species were found.

Based on overall ichthyofaunas, two groups of bendways were delineated that corresponded to impoundment and riverine habitats. Rattlesnake Bend and Cooks Bend were located in lower pool sections, where impoundment conditions prevailed, and their ichthyofaunas were dominated by clupeids (shad) and centrarchids (sunfishes, crappies, and basses). Hairston Bend, essentially a riverine reach during this study, was dominated by cyprinids (minnows), ictalurids (catfishes), and catostomids (suckers). Big Creek Bendway, unique in having both riverine and lacustrine habitats, was faunistically most similar to Hairston Bend, but also showed moderate similarities to the other bendways.

The number of species collected at a bendway and the mean species diversity decreased from Hairston Bend downstream to Rattlesnake Bend. The mean numerical catch per unit of effort C/f and the mean number of species per station were considerably higher at Big Creek Bendway and Cooks Bend than at Hairston Bend and Rattlesnake Bend. The mean total weight of fish per unit of effort C/y was more similar among bendways. The C/f, C/y, and means number of species per station differed among areas within individual bendways.

PREFACE

The study described in this report was sponsored by the Office, Chief of Engineers, U. S. Army under the Environmental and Water Quality Operational Studies (EWQOS) Program, Work Unit VIIB, Waterway Field Studies; Long-Term Field Studies Associated with the Environmental Quality of the Tennessee-Tombigbee Waterway Project. The EWQOS Program has been assigned to the U. S. Army Engineer Waterways Experiment Station (WES) under the direction of the Environmental Laboratory.

This report presents results of a study of physical, chemical, and biological characteristics of four cutoff bendways in the Tombigbee River between Demopolis, Ala., and Columbus, Miss., conducted during 1979 and 1980. Portions of the data were collected for WES by the U. S. Fish and Wildlife Service, Mississippi Cooperative Wildlife and Fisheries Research Unit, under Interagency Agreement No. WES-79-12.

The report was prepared by Dr. C. H. Pennington, Mr. J. A. Baker, Dr. F. G. Howell, and Ms. C. L. Bond under the direction of Dr. Thomas D. Wright, Chief Waterways Habitat and Monitoring Group; Mr. Bob O. Benn, Chief, Environmental Systems Division; Dr. Jerome L. Mahloch, Program Manager, EWQOS; and Dr. John Harrison, Chief, EL.

The Commanders and Directors of WES during the study and the preparation of this report were COL Nelson P. Conover, CE, and COL Tilford C. Creel, CE. Technical Director was Mr. Fred R. Brown.

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CONTENTS

A STUDY OF CUTOFF BENDWAYS ON THE TOMBIGBEE RIVER

PART I: INTRODUCTION

Background

1. The idea of connecting the Tennessee River to the Tombigbee River was first conceived in the 1700s and presented to the King of France by Sieur de Bienville. The idea was brought before the U. S. Congress twice in the 1800s but was not authorized until the River and Harbor Act of 1946. Planning and design continued under the auspices of this Act until the 1951 House Appropriations Committee examined the project and concluded that it was not economically feasible at that time. Planning funds were revoked and the project lay idle for a period of 16 years. Preconstruction planning resumed in 1967 after economic justification was established. The waterway, one of the largest public works projects ever undertaken in this country, was officially dedicated in Mobile, Alabama, in May 1971.

2. When completed, the Tennessee-Tombigbee Waterway (TTW) will provide a shorter and more direct waterway connecting the Gulf Coast region and the Tennessee, Ohio, and upper Mississippi River valleys, a new interregional trade route. The project has three sections: (a) a 40-mile divide cut from Pickwick Lake, Mississippi, to Bay Springs, Mississippi; (b) a 44-mile canal section from Bay Springs, Mississippi, to Amory, Mississippi; and (c) a 148-mile river section from Amory, Mississippi, to Demopolis, Alabama.

3. The river section has a series of meander loops or bendways, some of which have been or will be cut off to reduce the length of the waterway. Cutoff channels are formed by excavating a new channel across the neck of a bendway. The resulting cutoff bendways, often analogous to oxbow lakes, offer excellent potential for recreation and for fish and wildlife habitat. The data base for determining the benefits of man-made cutoff bendways and for design and subsequent management is extremely limited.

Purpose and Scope

4. The U. S. Army Engineer Waterways Experiment Station (WES) conducted a two-year field-oriented research program to investigate the cutoff bendways associated with the TTW Project to establish a sound data base for the design and management of these areas. Cutoff bendways are not unique to the TTW construction but are common in the natural condition of meandering streams and wherever river navigational projects occur. For this reason, a better understanding of natural and man-made processes and their subsequent effect on the biota of the TTW may lead to various management strategies for developing and utilizing the potential of cutoff bendways.

5. This report contains preliminary results of investigations conducted in four bendways located in the river section of the project. Sampling was conducted from January 1979 to September 1980. The 1979 data were collected by WES personnel and the 1980 data by U. S. Fish and Wildlife Service, Mississippi Cooperative Wildlife and Fisheries Research Unit.

PART II: STUDY AREA

6. The Tombigbee River rises in Tishomingo and Prentiss counties in northeast Mississippi. The system flows generally southeast and drains most of northeast Mississippi and west Alabama (Figure 1). The Tombigbee River flows into the Mobile River near Mt. Vernon, Alabama.

7. All four sites selected for this study were within the river section of the TTW Project and were located on the upper Tombigbee River between Demopolis, Alabama, and Columbus, Mississippi. The sites were Rattlesnake Bend, Cooks Bend, Big Creek Bendway, and Hairston Bend. When the TTW is complete, all four bendways will be severed from the main navigation channel (two were cut off before and one during the study). The four bendways are of different ages and sizes, are located in different positions in the navigation pools, and are in various stages of transition (Figure 2). The following is a general description of the collection sites.

a. Rattlesnake Bend-part of the boundary between Greene and Sumter counties, Alabama, located at river mile 223 within the Demopolis Pool section of the waterway. The 1.1-mile cut was completed in 1976 and the resulting bendway is approximately 10 miles in length.

b. Cooks Bend-located in Sumter County, Alabama, within the Gainsville Pool section of the waterway at river mile 277. The 1.0-mile cut was completed in January 1980, midway through the study. This bendway is approximately 4 river miles in length.

c. Big Creek Bendway-located in Pickens County, Alabama, at river mile 305, within the Gainsville Pool immediately below the Aliceville Lock and Dam. The 1.1-mile cut was completed in 1979 and the resulting cutoff bendway is approximately 3 river miles in length.

d. Hairston Bend-located in Lowndes County, Mississippi, at approximately river mile 318 about midway between Columbus, Mississippi, and Pickensville, Alabama, in the Aliceville Pool section of the waterway. This bendway is 5 river miles in length and had not been cut off during the study period.

8. Sampling transects at each location were established in the river reaches above and below the cut, within the cut, and within the

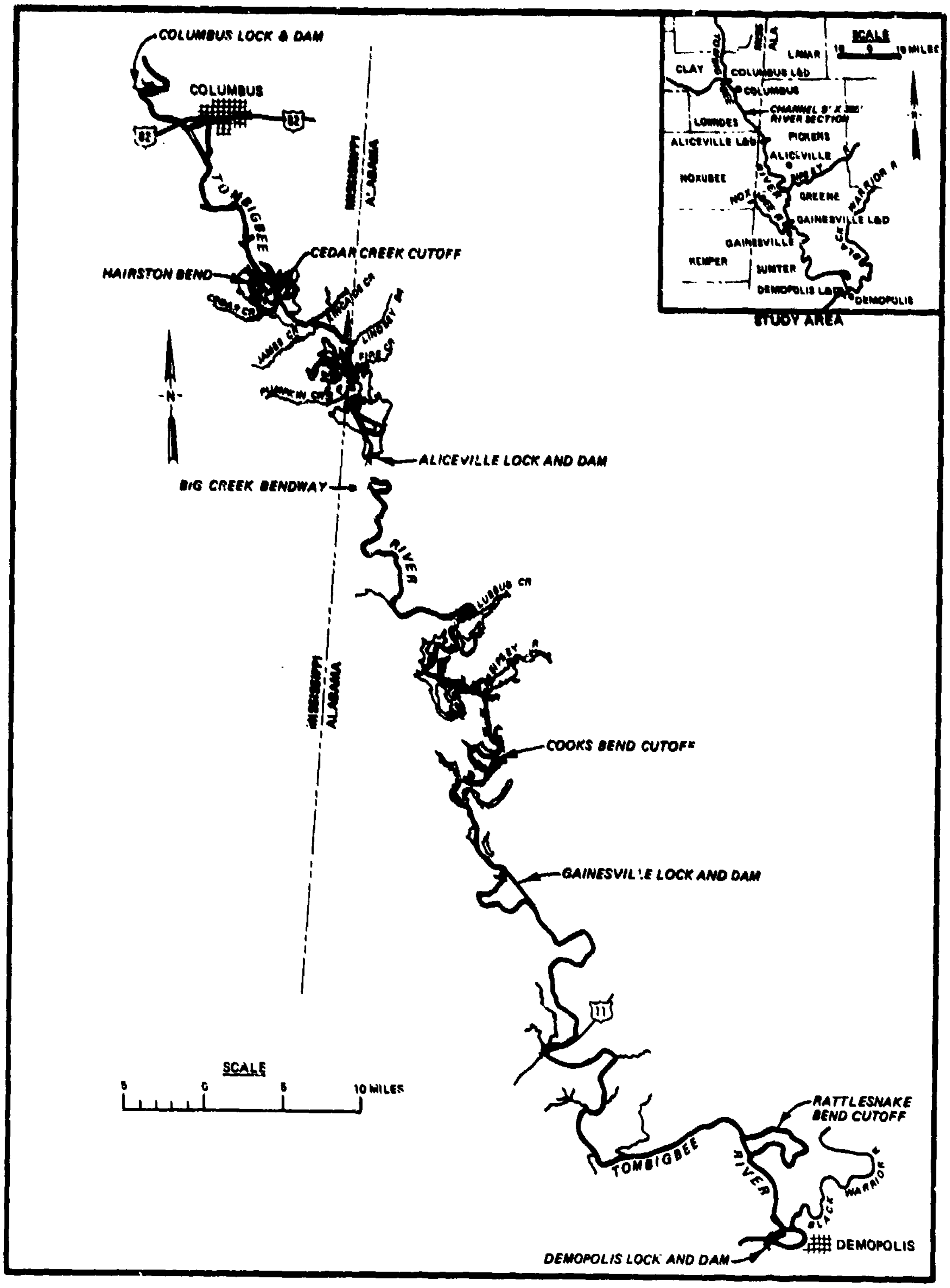

Figure 1. Map of study site

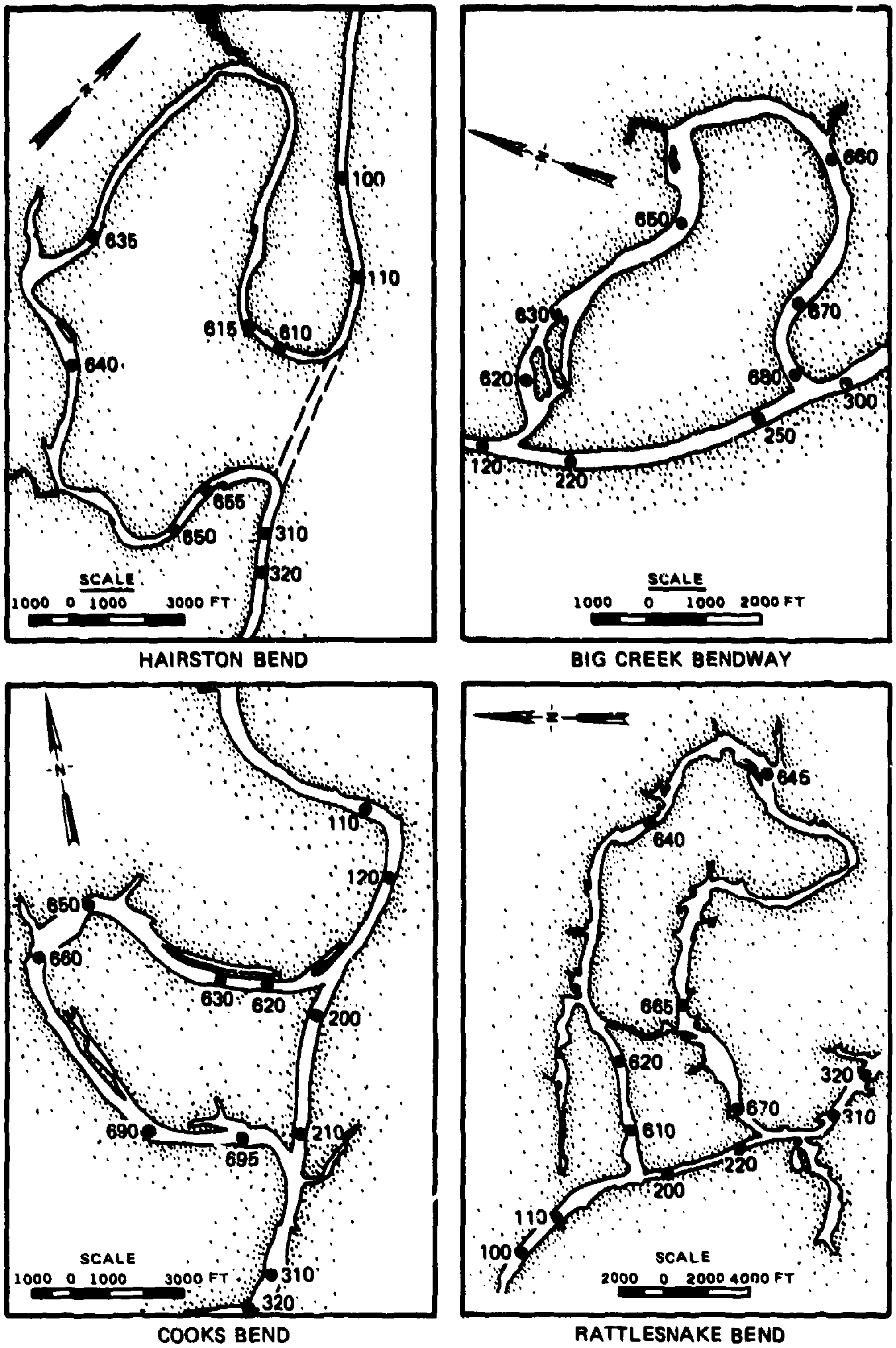

Figure 2. Transect locations and numbers on Hairston, Cooks, and Rattlesnake Bends and Big Creek Bendway

cutoff bendway. Transects at a site were numbered according to the following scheme: 100s-above the bendway; 200s-within the cut; 300s-below the bendway; and 600s-within the bendway (Figure 2). Transects were oriented perpendicular to the banks. Three stations were established along each transect: left bank, right bank, and midchannel.

PART III: MATERIALS AND METHODS

9. Data were collected to characterize the physical, chemical, and biological variables in the cutoff bendways and the river reaches associated with each bendway.

10. Sampling was conducted to coincide with four different river stage/water temperature regimes:

- Late Fall - moderate flow/decreasing temperatures.
- Winter - high flow/low temperatures.
- Spring - high flow/rising temperatures.
- Summer - low flow/warm temperatures with increasing probability of thermal stratification.

Seven major sampling efforts were conducted in 1979 and 1980. During 1979, sampling was conducted in January, March, August, and December and during May, June, and July of 1980. Additional samples for water-quality variables were taken during the summer of 1980.

Sediments

11. Bottom profiles and sediment composition information were provided by the U. S. Army Engineer District, Mobile. Grain-size analyses were determined by techniques outlined in Engineer Manual 1110-2-1906 (Department of the Army 1970). For the purposes of this investigation, sediment grain sizes were grouped into three general categories: particles $>8000\ \mu$ constituted gravel; 8000 to 125 μ constituted the range of sands; and fines were particles $<125\ \mu$. Values were expressed as percentages by weight of each category. Sediment compositions given in this report represent means for the three grain-size categories from three samples on each transect.

Water Quality

12. Surface water-quality data were collected from the three stations on each transect at each bendway. At each midchannel station

water samples were also collected from middepth and just above the bottom. A Hydrolab Series 8000 was used to make in situ measurements of pH, temperature, conductivity, and dissolved oxygen (DO). Visibility (transparency) was determined in the field using a Secchi disk. Water samples were preserved on ice and returned to the laboratory for analysis of turbidity, carbon dioxide, total alkalinity, ammonia nitrogen, nitrate and nitrite nitrogen, orthophosphorus, and total phosphorus (APHA 1975).

13. Standard procedures were followed to ensure instrument accuracy; i.e., the Hydrolab 8000 was calibrated at the start of each sampling day with standard solutions and procedures as recommended by the manufacturer. Accuracy estimates on Hydrolab-determined water quality parameters are as follows: temperature ± 0.2°C; DO ± 0.2 mg/ℓ; conductivity ± 20 μmho; and pH ± 0.1 pH unit. Precision of the nitrogen and phosphorus determinations was ± 0.005 mg/ℓ. Report accuracy was as follows: nitrite-N ± 0.01 mg/ℓ; nitrate-N ± 0.10 mg/ℓ; ammonia-N ± 0.02 mg/ℓ; total phosphorus ± 10 percent of reported value; and orthophosphorus ± 10 percent of reported value.

Phytoplankton and Photosynthetic Pigments

14. Phytoplankton samples (500 ml) were dipped from the surface and preserved with 5 ml Lugol's solution. Samples were enumerated by the Utermohl procedure described by Lund et al. (1958). Plankton counts were made at 320X by examination of a horizontal strip in the counting chamber. Enumeration of phytoplankton within these strips followed procedures outlined in Standard Methods (APHA 1975). Plankters were identified according to Belcher and Swale (1979), Palmer (1977), Prescott (1962, 1970), Smith (1980), Ward and Whipple (1959), and Whitford and Schumacker (1973).

15. Water samples for pigment analyses were dipped from the surface, labeled, stored in polyethylene jars in a cool ice chest, and transported back to the laboratory. Samples (500 ml) were filtered by vacuum pump; a fixative (magnesium carbonate) was added; and glass fiber

filter pads were frozen to preclude pigment degradation.

16. During laboratory analysis, the filter pads were thawed and macerated with a tissue grinder, and the pigments were extracted overnight in 90-percent aqueous acetone in a dark refrigerator. Samples were centrifuged and decanted into 4-cm spectrophotometric cells for examination. Extinction values were measured and recorded at designated wavelengths by using a Beckman DK-2A ratio recording spectrophotometer, after correcting for optical inequalities (cell-to-cell blank) and turbidity (turbidity blank). Statistical analysis of plankton densities were made using a one-way ANOVA and Scheffe's Multiple Range Test.

17. Pigment concentrations were calculated as milligrams per cubic metre using formulae provided by Strickland and Parsons (1972) for chlorophylls *a*, *b*, and *c*, and phaeophytins. Carotenoid values were calculated as millispecified plant pigment units. The specified plant unit (SPU) has attained international acceptance (Strickland and Parsons 1972) for quantifying carotenoids.

18. A one-way ANOVA was used to determine if pigment concentrations varied significantly with season, among bendways, or within individual bendways. When significant differences were indicated, the Student-Newman-Keuls Multiple Range Test was used to separate the significantly different values.

Aquatic Macrophytes

19. A survey was conducted of each bendway study site to collect data on species composition, relative abundance, and spatial distribution patterns of beds of aquatic vegetation. The importance of a bed of vegetation was determined by its spatial coverage or abundance. Densities or other quantitative estimates were not made.

20. The bendway, cut, and river proper above and below the bendway at each of the study areas were examined by boat along both banks and in adjacent shallow water areas. For the purposes of this study, aquatic macrophytes were considered to be more highly developed plants which normally start in water and must grow for at least part of their

life cycle in water, either completely submersed or emersed (Muenscher 1944).

Mollusk Survey

21. Survey methodology consisted of dragging a 6-ft brail from a boat plus handpicking along the river bank at exposed sand bars. The brail was dragged down-river suspended from the bow of a 16-ft john-boat. Each pass with the brail lasted about 10 min. Brailling was usually conducted on both sides of the river at transects used for other portions of the field study. At Rattlesnake Bend, 24 stations were brailed. At each of the other three bendways (Big Creek Bendway, Cooks Bend, and Hairston Bend) 10 to 12 10-min drags were completed. For the four bendways, 57 drags were conducted. Collection time for handpicking shells ranged from a few minutes to approximately 30 min. Brailing is not considered an accurate quantitative mussel sampling method (Thiel et al. 1980, Nelson in press) and comparisons among bendways were made on the basis of species lists only. All specimens were saved.

Macroinvertebrates

22. A petite ponar grab sampler was used to obtain benthic samples from eight transects at Hairston and Rattlesnake Bends (one above, one below, and six within each bendway) and from six transects at Big Creek Bendway and Cooks Bend (one above, one below, and four within each bendway). Two benthic samples were obtained from each of the three stations on a transect during each major sampling effort.

23. Samples were emptied into a standard mesh (#30) wash bucket and washed using a suction pump. The residue left on the mesh was then transferred into polyethylene jars and preserved with 10-percent buffered formalin. Jars were labeled and transported back to the laboratory for analyses.

24. In the laboratory, small portions of each sample were placed in standard petri dishes having concentric circles drawn on the bottom.

Organisms were picked from the detritus in each petri dish (using the concentric circles as reference) under steroscopic microscope. Hand-picked organisms were sorted and placed in labeled vials containing 70-percent alcohol. This method was continued until all of the sample was examined.

25. For the analyses presented in this report, species were regrouped according to family in order to improve taxonomic accuracy. Family names were those listed in Merritt and Cummins (1978) for aquatic insects and Pennak (1978) for noninsect macroinvertebrates. Seasonal samples by bendway were reported as numbers of individuals by family. These data were used to calculate relative abundance (percent occurrence), family diversity (Shannon's formula, log base 2), and family similarity (Jaccard coefficient and Morisita index). The Jaccard similarity index is useful in attempts to examine agreement (or disagreement) in occurrence of taxa between two collections. The index ranges from 0.0 (no agreement) to 1.00 (perfect agreement) and is expressed as percentage. Morisita's index, which is based upon presence-absence and numbers of individuals present within a given taxon, is more of a quantitative measure of agreement between two collections. Values can range from 0.0 to above 1.0 with 1.0 approximating complete uniformity in agreement. Formulae and examples of calculation of these indices can be found in Brower and Zar (1977).

Fish

Collection

26. Fish were collected primarily with hoop nets and electrofisher for quantitative analysis. Two sizes of hoop nets (2- and 3-ft mouth diam) were used in this study. Both were double-throated, had seven fiberglass hoops, and were covered with 1-in.-square-mesh netting. The nets were fished unbaited adjacent and parallel to the banks with the mouth facing downstream. One net of each size was used at each transect. A flip of the coin was used to determine which size net would be placed on each bank. Nets were set for a single 48-hr period at each station.

27. During the 2-yr study period, two commercially built electrofishing units were used. Both were operated in the pulsating DC mode at 60-120 pulses per second. Electrofishing stations were permanently mar... 750 ft above and below the transect markers, for a total length of 1500 ft for each station. Stunned fish were captured by two persons standing behind safety railings at the front of the shocking boat and using 3/8-in.-square-mesh dipnets. Actual shocking time was recorded with a stop watch.

28. Supplementary gear types used intermittently during the study included seines and minnow traps. A 25-ft-long, 6-ft-deep minnow seine was pulled 25 ft along the bank at stations with suitable depths and free of obstructions. Prior dredging operations that created perpendicular banks and exposed streambank woody vegetation prevented seining at most stations, especially during high-flow stages. In some instances, the seine was taken offshore and retrieved toward shore from the front of the work boat where steep dredged banks prevented safe footing.

29. Minnow traps constructed of coarse-weave cotton muslin were fished at all bank stations during 1979. The baited traps were staked parallel along the banks with the single net throat opening facing downstream.

30. The level of effort for seining and minnow trapping could not be standardized across locations or times. Therefore, data from these sources are excluded from most statistical analyses and location-time species comparisons.

Enumeration

31. Whenever possible, larger fishes were identified and processed in the field. Juvenile fishes, minnows, and unusual fishes were preserved in 10-percent formalin for later examination. Total length in millimetres and weight in grams were recorded for all specimens in good condition. Additional data on sex and stage of maturity were collected for largemouth bass, white and black crappie, bluegill, flathead catfish, channel catfish, blue catfish, and freshwater drum.

32. For comparative purposes, each bendway was partitioned into four positions corresponding to those of the numbering system shown in

Figure 2. The four positions were: above (upstream of) bendway, within-bendway, below (downstream of) bendway, and within the cut, if a cut was present. Mean numerical catch per unit of effort (C/f), mean total weight of fish per unit of effort (C/y), and mean number of species per unit of effort were calculated for each position during each sampling period. The catch per unit of effort for all variables for hoop nets was based on catch per net per 48-hr set. For electroshocking, the unit of effort was a single 1500-ft station. Catch per unit of effort was not calculated for seining or minnow trapping data.

Analysis

33. An ANOVA by gear type was used to determine whether significant differences existed among positions at a bendway site during a sampling period. Data were transformed as $\log_{10}(X + 1)$ prior to analysis, as is generally appropriate for species abundances (Green 1979). Subsequent to the ANOVA, Duncan's New Multiple Range Test was used to examine the pattern of differences. A nested ANOVA by gear type was used to determine if significant differences existed among bendways during a sampling period. The 5-percent significance level was used in all analyses.

34. The Kulczynski similarity coefficient and the Bray-Curtis dissimilarity coefficient were calculated for each bendway pair at each sampling date. Shannon diversity was calculated for the total ichthyofauna of each bendway at each sampling date (Brower and Zar 1977).

35. A condition factor (k) was calculated for gizzard shad, freshwater drum, channel catfish, blue catfish, flathead catfish, white and black crappie, largemouth bass, and bluegill. Condition factors among bendways during a sampling period were compared using Duncan's Multiple Range Test.

PART IV: CHARACTERIZATION OF INDIVIDUAL BENDWAYS

Rattlesnake Bend

Sediments

36. Most transects at Rattlesnake Bend showed little change in either bottom profile or sediment composition (Figure 3). At upstream transects within the bendway, a sand plug is gradually forming that has reduced the river depth at this point by over 37 percent since the original 1977 survey. No other transect showed any significant profile changes.

37. Sand and fines comprised most of the substrate at Rattlesnake Bend, although the above-bend transect had small amounts of gravel (Figure 3). Sand is gradually replacing fines at this transect and at upstream transects within the bendway at the site of the partial filling noted in paragraph 36. Sediment composition remained virtually unchanged at all other transects.

Water quality.

38. Table 1 contains surface and subsurface water-quality data collected for Rattlesnake Bend during the study. In general, most values reflect seasonality with few obvious differences that could be attributed to sampling location. Temperature ranged from 8.0°C in December 1979 to 32.8°C in late July and late August 1980.* Dissolved oxygen ranged from 3.7 mg/ℓ in late August 1980 to 10.1 mg/ℓ in December 1979.

39. Current and pH were the only parameters for which there were significant transect differences at Rattlesnake Bend. Currents were generally low throughout this bendway; highest velocities were recorded during May 1980, when above bendway transects had mean surface and vertical profile currents of only 0.33 and 0.47 m/sec, respectively. River stations always had higher mean velocities than did within-bendway

* In the headings for tables and in figure scale captions, early and late month sampling are designated as (1) and (2), respectively.

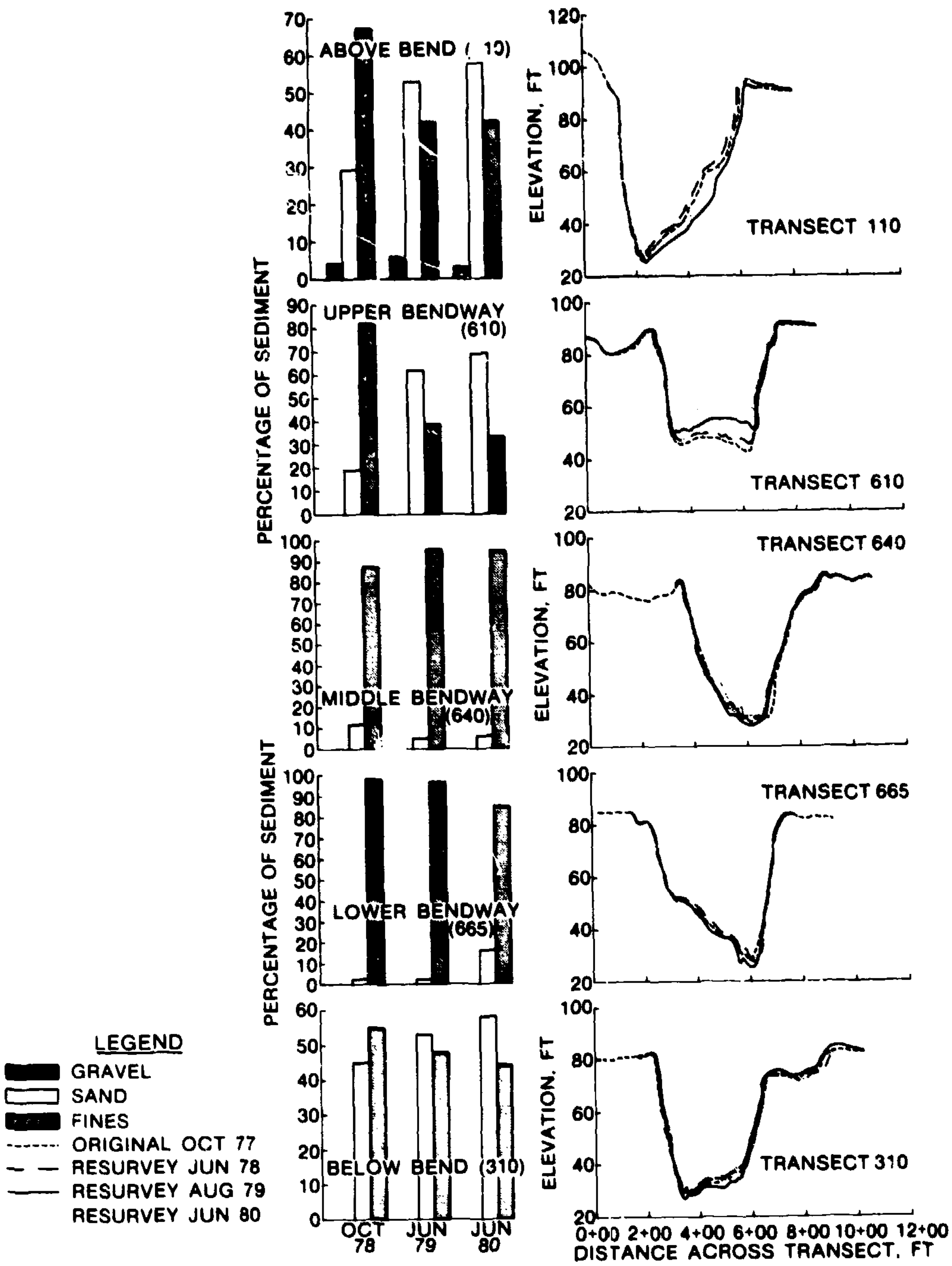

Figure 3. Sediment grain-size composition and depth profiles of five cross channel transects at Rattlesnake Bend

transects, although the differences were not always significant. Within-bendway stations generally had negligible currents.

40. Significantly different pH values among transects were found at Rattlesnake Bend, with measurements in upper portions of the bendway generally being the highest and in lower bendway transects the lowest. The differences were small and inconsistent, however. Surface pH increased from 7.0 in December to 8.5 in late July, and then decreased to 7.9 by September 1980. Mean vertical profile pH showed the same pattern but peaked at 8.1.

41. There was little difference in surface or vertical profile DO levels among transects for any sampling date. Most transects showed DO stratification, however, during July through September 1980. Many transects had severely depleted DO levels in the bottom strata at this time (less than 3.0 mg/ℓ), although the lowest average vertical profile value (bottom and middepth readings combined) was 3.7 mg/ℓ.

Phytoplankton and
photosynthetic pigments

42. The mean total number of phytoplankters at Rattlesnake Bend increased during 1980 with a peak population found during September 1980 (Figure 4). The division Chlorophyta was dominant throughout the year with the exception of the late August 1980 sampling period when numbers of Cyanophyta were slightly greater. Chlorophyta increased throughout the year with the exception of a slight drop in numbers from late July 1980 to early August 1980. Cyanophyta populations remained low until June when an increase was seen to late August, followed by a decrease in September. Chrysophyta populations were highest in early July, decreased only slightly in the next two sampling periods (late July and early August), decreased substantially in late August, but increased greatly in September. The Euglenophyta population remained fairly low throughout the year then increased sharply to their highest population in September. Division Pyrrhophyta and Cryptophyta were relatively low where encountered.

43. At this bendway the dominant individual plankters were unidentified filaments, which were probably a blue-green algae (Division

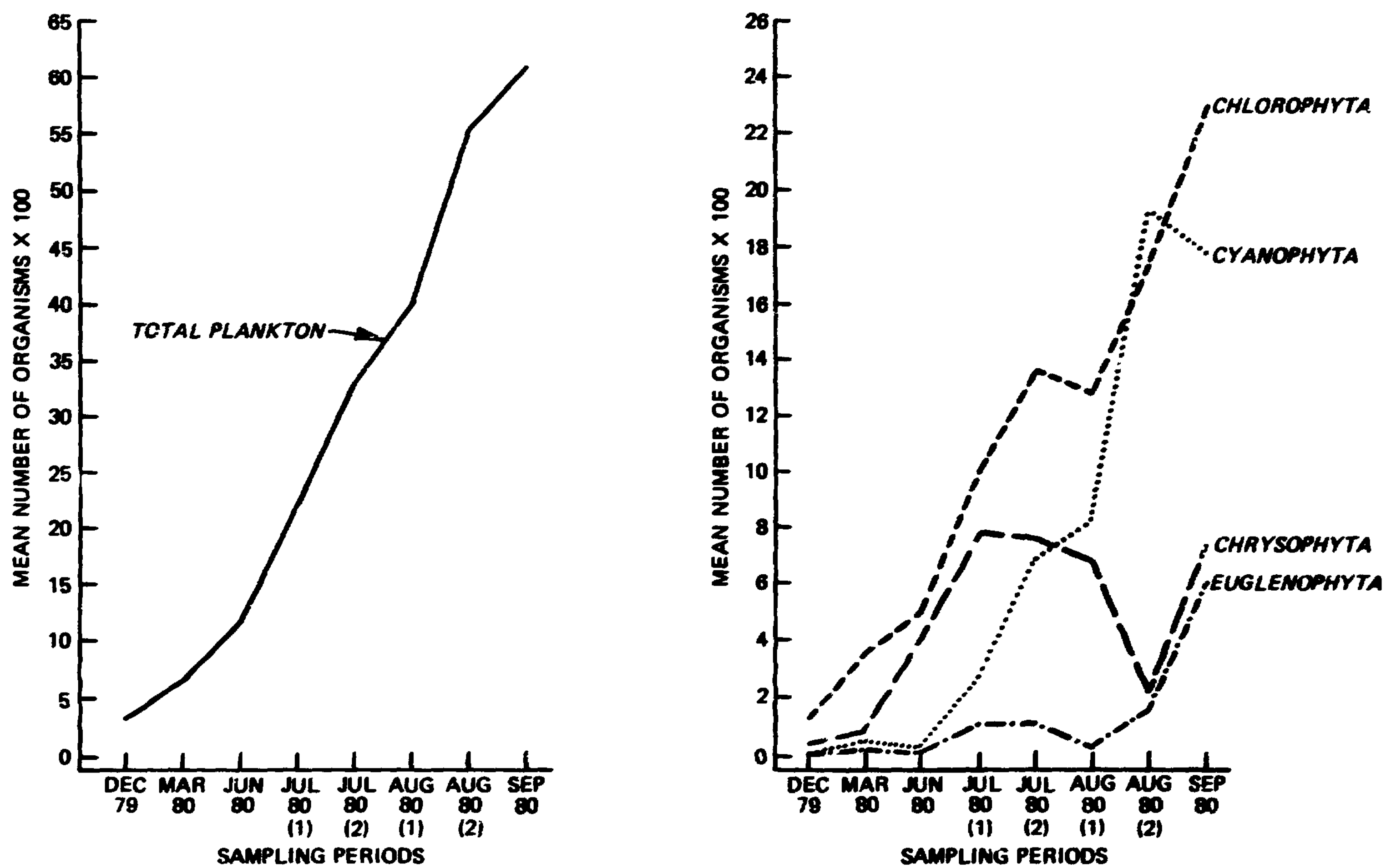

Figure 4. Mean number of total plankton and mean number of plankters by division from Rattlesnake Bend, December 1979-September 1980

Cyanophyta). A green algae, Ankistodesmus sp., was second in importance. Surface samples showed a slightly different order of dominance than did all samples combined. Two blue-green algae, Anabeana sp. and Oscillatoria sp., ranked third and fourth, respectively, for surface samples and fourth and fifth, respectively, for combined samples. The diatom, Melosira sp., was third in dominance for all samples combined. No significant differences were found at this bendway between plankters within the river transects and the within-bendway transects.

44. All pigment concentrations for Rattlesnake Bend varied significantly over the sampling periods (Table 2). The sampling periods of early and late July exhibited high chlorophyll *a* values, although peak concentration occurred in early August. Low levels of chlorophyll *a* were obtained during December and May. Chlorophyll *b* was highest during late August and was significantly different from values recorded at other sampling months. Chlorophyll *b* lows occurred during December and late July. Lowest carotenoid levels were experienced during December, May, June, and September. Values were highest during early and late August for carotenoid 1 and 2.

Aquatic macrophytes

45. The Rattlesnake Bend area of the river contained numerous scattered patches and strips of water-willow. Water-willow was confined to rocky and sandy substrate in sunny areas at the water's edge. Rarely did these plants extend over 2 to 3 ft into the water. Their greatest concentration occurred near the right bank of transect 645. At this location, a dense bed approximately 500 ft long and 3 ft wide was observed. Isolated clumps and strips 10 to 50 ft long were common throughout the bendway. Scattered clumps and short strips were common below the bendway. A few patches were found above the bendway. This plant was absent from the cut area.

46. Giant cutgrass (Zizaniopsis miliacea) and wild millet (Enchinochloa crusgalli) were frequently observed in the bendway, but were not extensive. Of the two, giant cutgrass was more common. In the bendway these plants were found on the bank several feet from the water's edge.

Macroinvertebrates

47. Table 3 illustrates the dominant macroinvertebrate families collected at Rattlesnake Bend during the study. In all, 38 families and 5652 individuals were collected. Of these, 6 families occurred in every seasonal collection and accounted for 94.3 percent of the total collection. These were: Chironomidae 27.6 percent; Chaoboridae 22.9 percent; Ephemeridae 22.2 percent; Tubificidae 13.6 percent; Sphaeriidae 4.0 percent; and Ceratopogonidae 4.0 percent.

48. Families contributing 0.1 to 1.1 percent to the overall collection of macroinvertebrates at Rattlesnake Bend were: Naididae 0.3 percent; Glossoscolecidae 0.1 percent; Lumbricidae 0.1 percent; unidentified pelecypods 0.9 percent; Pleuroceridae 0.1 percent; Unionidae 0.2 percent; unidentified gastropods 1.1 percent; Viviparidae 0.1 percent; Bulimidae 0.1 percent; Talitridae 0.1 percent; Gammaridae 0.1 percent; Cypridae 0.1 Percent; Caenidae 0.2 percent; Gomphidae 0.1 percent; Polycentropodidae 0.6 percent; Leptoceridae 0.3 percent; Hydropsychidae 0.2 percent; Sialidae 0.6 percent; Elmidae 0.2 percent; and unidentified Diptera 0.1 percent. None of these families was consistently represented in all seasonal collections.

49. Rare families, those represented by only four or fewer individuals and contributing less than 0.1 percent to the overall collection, were: Haplotaxidae (worms); Corbiculidae; Physidae; Lymnaeidae, and Bithyniidae (mollusks); unidentified zygopterans, Coenagrionidae, and Libellulidae (Odonata); unidentified hemipterans and Corixidae (water boatmen); Dytiscidae (beetles); and Simuliidae (blackflies).

50. Seasonal collections at Rattlesnake Bend contained between 12 (December 1979) to 21 (March 1979) macroinvertebrate families and between 1446 (January 1979) to 390 (March 1979) individuals. There were no obvious seasonal trends in numbers of families or in numbers of individuals collected.

51. Shannon's diversity indices were consistently high throughout the study, ranging from 1.97 (January 1979) to 2.76 (June 1980). Shannon's diversity for the overall Rattlesnake Bend collection was 2.70.

52. Similarity indices based on presence-absence of families

(Jaccard coefficient) indicated that seasonal collections from Rattlesnake Bend were characterized by low to medium similarities, ranging from 27.6 to 63.2 (Table 4). The Morisita index indicated higher seasonal collection similarities, ranging from 0.40 to 0.96 (Table 4). Considering both of the above indices, Rattlesnake Bend collections, while containing several families that were not equally represented across seasons, contained reasonably similar proportions of dominant macroinvertebrate families.

53. Duncan's Multiple Range Tests separated bendway station from river station densities at Rattlesnake Bend in four of the seven collections (January, March, and December 1979 and June 1980). Mean densities for these periods ranged from 1349 (January) to 575 per m^2 (June).

Mollusk survey

54. Only one clam, Quadrula quadrula, was collected at Rattlesnake Bend when the survey was conducted on 2 September 1980. It was found in the downstream reach of the cut.

Fish

55. Forty-two species of fish, comprising 4683 individuals, were collected at Rattlesnake Bend. The number of species occurring during any one sampling period ranged from 16 to 28 and the number of individuals from 97 to 1172. Gizzard shad, bluegill, white crappie, and largemouth bass comprised 63.3 percent of the total individuals, and an even larger proportion of the total biomass. Gizzard and threadfin shad alone comprised 39.8 percent of the total number of fishes collected at Rattlesnake Bend.

56. The abundance of the more typical riverine species, such as the various minnows and shiners, was generally low at this bendway. The minnows and shiners comprised 22.6 percent of the total catch. Although 15 species of minnows and shiners occurred at this bendway, none were collected at every sampling date and only two occurred at five or more times. The high abundance of the silverside shiner (12.6 percent of the total catch) was probably a sampling artifact. Almost all the individuals (95.6 percent) of this species were collected during a single sampling period.

57. The abundance of suckers, typical of riverine habitats, was low at this bendway, both in terms of overall relative abundance (1.0 percent of total catch) and number of species (6). Of these six sucker species, two occurred at only one sampling date.

58. Sport and commercial species comprised over one-third of the fishes collected at this bendway. Largemouth bass, bluegill and other congeneric sunfishes, and the two species of crappie collectively constituted 26.2 percent of the catch. Catfishes and freshwater drum made up 6.2 and 2.2 percent of the catch, respectively.

59. Relative abundance of white crappie, threadfin shad, and gizzard shad varied considerably among sampling dates (Table 5). Although white crappie were present at each sampling date, 81.8 percent were collected during January and March 1979. Threadfin shad ranged from 3 to 923 individuals at a single sample date; relative abundance varied from 0.4 to 78.6 percent. Of the species comprising more than 1.5 percent relative abundance, only bluegill, largemouth bass, and freshwater drum were consistent in terms of numbers and relative percentage of the catch among sampling dates. Four species of fish, silver chub, river shiner, silverband shiner, and striped mullet, were unique to Rattlesnake Bend. Of these, only the silverband shiner was abundant (154 individuals collected).

60. The $\log_{10}$ ANOVA of electroshocking data showed no significant differences in C/f, C/y, and mean number of species per unit of effort among positions at Rattlesnake Bend at any sampling period (Table 6). Hoop netting indicated significant differences only twice. During December 1979 differences among positions occurred when no fish were captured at above-bendway stations. During May 1980 the mean weight of fish per station in the bendway was significantly lower than at river channel stations.

61. Although significant differences seldom occurred, the within-bendway stations tended to have higher mean numbers of fish and species, as well as higher mean weights (Table 6). This may be due to the presence of more varied habitat (e.g., submerged trees, varying bankline configuration, and a wider range of depths) at within-bendway stations.

Electroshocking indicated higher values for all variables for within-bendway stations compared to river channel stations. Although differences were much smaller, hoop-netting data suggested the opposite relationship.

62. The four bendway positions had similar ichthyofaunas (Tables 7-10), both overall and at any sampling date. The within-bendway position, as noted above, did tend to have more species at any time, but the much larger number of samples collected there may have been the cause rather than any intrinsic difference in the actual fauna.

Cooks Bend

Sediments

63. The cut at Cooks Bend was not completed until the spring of 1980, although the bendway had been impounded for several years. From impoundment through August 1979, the bottom profile did not change appreciably at any transect (Figure 5). The June 1980 resurvey following the channel cut, however, indicated that sand was beginning to accumulate in the upper bendway (Figure 5).

64. Composition of the sediment at Cooks Bend did not change greatly between the October 1978 and June 1980 surveys. As noted above, some deposition of sand occurred in the upper reaches of the bendway. The only other significant change was a decrease in gravel and an increase in silt at the mid portion of the bendway.

Water quality

65. Physical data collected for surface and subsurface water-quality parameters for Cooks Bend (Table 11) indicated no major differences between transects above, inside, or below the bendway during the study period. All values recorded for temperature, DO, pH, and conductivity during a given sampling period were within instrument sensitivity and/or ranges attributable to diurnal fluctuations. Values recorded for these parameters over the entire study reflected seasonality.

66. Only current velocity showed transect differences at Cooks Bend. Although the differences were slight and generally nonsignificant

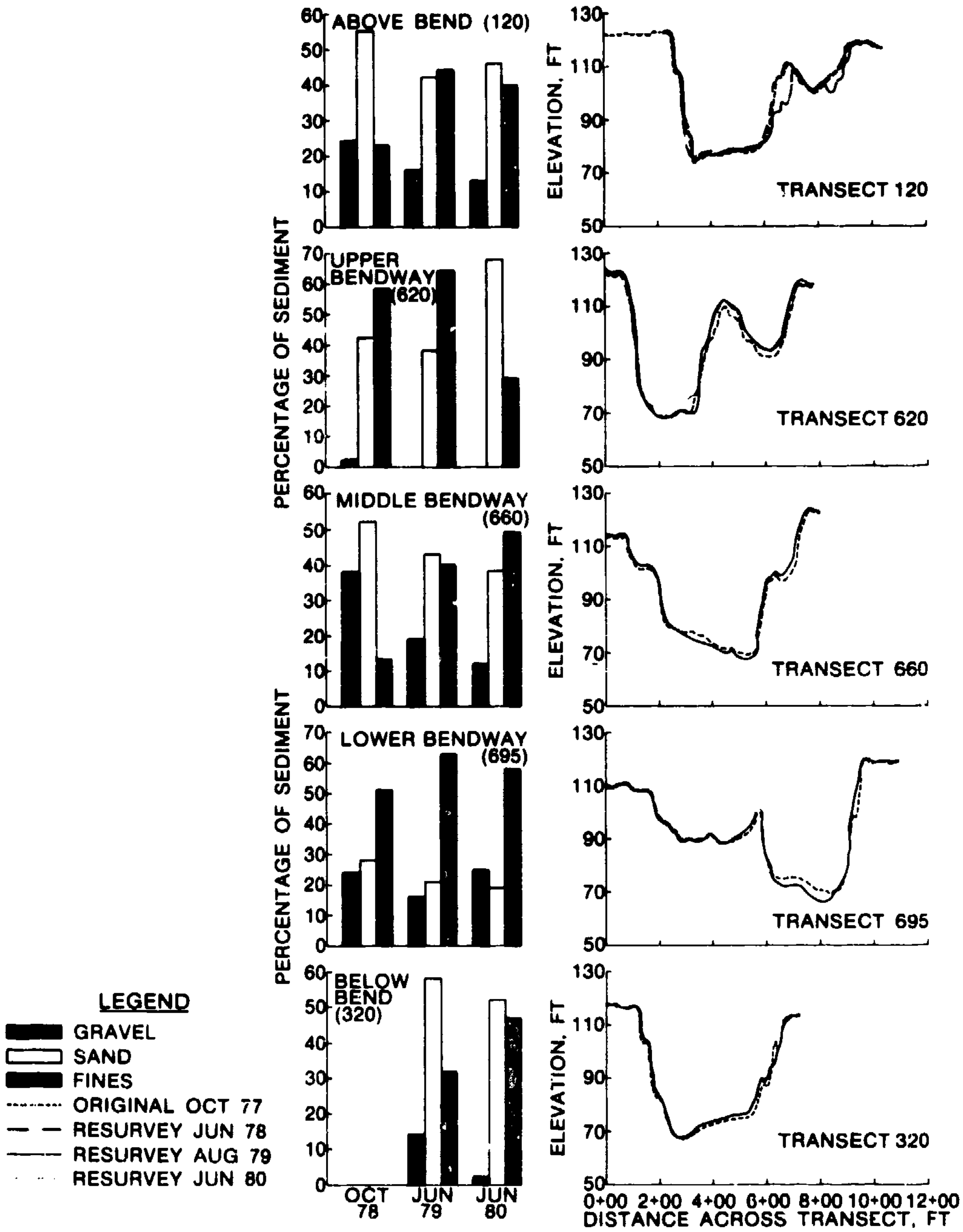

Figure 5. Sediment grain-size composition and depth profiles of five cross channel transects at Cooks Bend

at any sampling date, the river transects consistently had higher currents than the within-bendway transects. Velocities at this bendway were appreciable only during May 1980, when means of 0.22 and 0.45 m/sec were recorded for surface and vertical profiles, respectively. At most other sampling dates, the current averaged less than 0.10 m/sec in river transects and was negligible in within-bendway transects.

Phytoplankton and
photosynthetic pigments

67. At Cooks Bend the total number of organisms increased from December to early June, decreased to late July, increased again in early August and remained approximately the same throughout the last two sampling periods, late August and September (Figure 6). Chlorophyta's highest numbers occurred in early July, declined in late July, rose again in early August, and declined again in late August and September. The numbers for the division Chrysophyta increased steadily to late July, decreased through late August, then rose rapidly to a high in September. Division Cyanophyta reached a peak population in early July. Euglenophyta numbers remained relatively low throughout the year.

68. Division Pyrrhophyta was not present in December samples and division Cryptophyta was not present in December and late July samples. Only at this bendway did divisions Pyrrhophyta and Cryptophyta show mean numbers of organisms above 100/ml. In June division Cryptophyta had a mean of 154/ml, and in September division Pyrrhophyta had a mean of 146/ml. The dominant individual plankter at Cooks Bend for all samples was the diatom *Melosira* sp. Unidentified filaments and unidentified diatoms were second and third in dominance, respectively.

69. Concentrations of total chlorophyll, total phaeophytin, and phaeophytin did not vary significantly at Cooks Bend over the sampling period (Table 2). Concentrations of other pigments were found to vary significantly over all seasons.

70. Chlorophyll *a* values increased from May, experienced two peaks (early July, 0.915 mg/m^3; early August, 0.901 mg/m^3), and decreased thereafter. Chlorophyll *b* concentrations were considerably lower than chlorophyll *a* values. Chlorophyll *b* concentration during

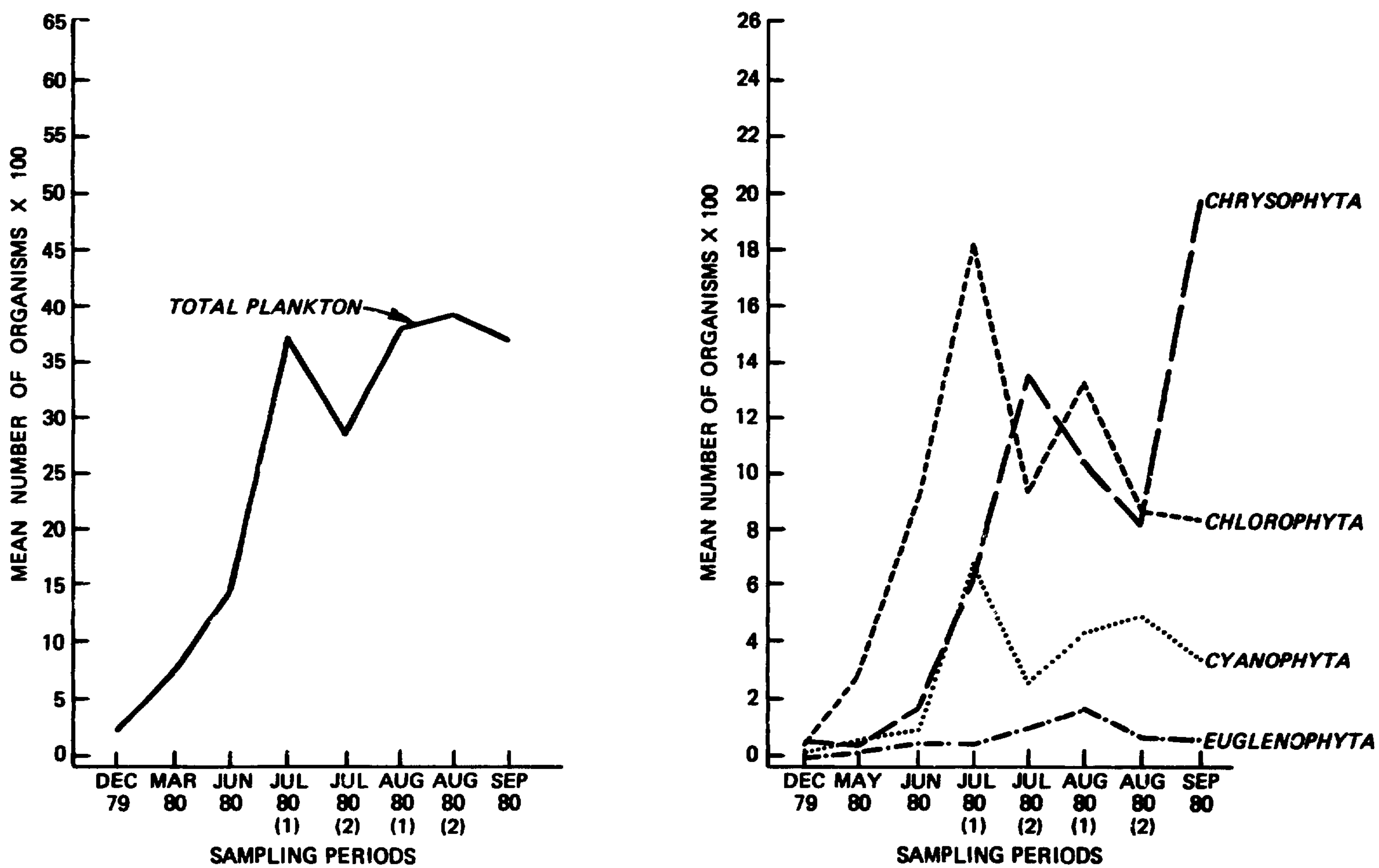

Figure 6. Mean number of total plankton and mean number of plankters by division from Cooks Bend, December 1979–September 1980

ate August (0.460 mg/m^3) was higher than those at other times of the year.

71. Maximum carotenoid values at Cooks Bend were obtained during early August. A secondary increase in carotenoids was noted during early July. The months of June, late July, and late August were similar in carotenoid concentration. This was also true for December, May, and September when carotenoid concentrations were low.

Aquatic macrophytes

72. Water primrose (Ludwigia sp.) was quite common in this area, but rarely extended farther than 1 or 2 ft into the water. The exception to this was found along the backwater side of an extensive sand bar that formed along the right bank from the head of the bendway (transect 610) to the vicinity of transect 640. In these quiet water areas, water primrose formed extensive mats that extended several feet from the bank. Patches of these plants were found throughout the bendway and below the cut. Near transect 660 on both banks, 100-ft-long strips of water primrose were observed. A few small patches were found in sandy areas above the cut. It appeared that these plants preferred sandy areas exposed to full sunlight.

73. Small clumps of arrowhead (Sagittaria sp.) were found near transects 630, 669, and 320; between 680 and 690; and at a few other locations in the bendway and below the cut. No aquatic plants were observed in the cut.

Macroinvertebrates

74. Table 12 presents summary data for the dominant macroinvertebrate families collected at Cooks Bend during the study. In all, 38 families and 5497 individuals were collected. The four most abundant families were Chironomidae 38.2 percent, Tubificidae 24.5 percent, Chaoboridae 21.1 percent, and Ephemeridae 5.2 percent. Individuals representing these families were collected in every sampling effort of the study. The next three most abundant and frequently collected families were Naididae, Sphaeriidae, and Ceratopogonidae. Combined, these seven families accounted for 95 percent of the benthos collected at Cooks Bend.

75. Of the remaining families, the Leptoceridae were represented by 58 individuals (1.1 percent in the total collection). Lumbriculidae, Pelecypoda, Unionidae, Gastropoda, Physidae, Talitridae, Asellidae, Caenidae, Coenagrionidae, Macromiidae, Gomphidae, Polycentropodidae, Hydropsychidae, Hydroptilidae, Elmidae, Dytiscidae, and unidentified Diptera contributed 0.1 to 0.7 percent to the overall collection. Only one or two individuals represented the Enchytraeidae, Lumbricidae, Planorbidae, Lymnaeidae, Palaemonidae, Gammaridae, Phryganeidae, Corixidae, Hydrophilidae, Chrysomelidae, Heteroceridae, and Tabanidae.

76. Table 12 also contains summary data for numbers of families, total numbers of individuals, and diversity indices for the seasonal collections at Cooks Bend. The largest number of families (21) and individuals (1807) were collected during the January 1979 effort whereas the smallest number of families (10) and individuals (249) were collected during March 1979.

77. Duncan's Multiple Range Test showed that there was no location effect upon the densities of organisms per station or the number of organisms per station collected from different sections of Cooks Bend during the study. Densites ranged from 8.13 (May 1980) to 173 per m^2 (July 1980) and number of taxa per station ranged from 1.74 (March 1979) to 10.47 per m^2 (January 1979).

78. Family diversities for seasonal collections ranged from 1.83 (August 1979) to 2.67 (June 1980) and showed no obvious trends that could be related to season, although collections with larger numbers tended to show lower diversity values and collections with smaller numbers tended to show higher diversity values.

79. Seasonal collections at Cooks Bend showed low Jaccard similarity coefficients (Table 13). The highest value occurred for the March and August 1979 collections, and the lowest value was for the January 1979 and July 1980 collections (17.2 percent). The 1979 collections showed lower similarity values among themselves (29.2 to 53.3 percent) than did the 1980 collections (40 to 45 percent).

80. Similarity values calculated on both numbers and kinds (Morisita's), however, showed more consistency than those calculated on

kinds (Jaccard's). The 1980 collections, for example, showed similarities ranging from 0.77 to 0.88; the 1979 collections ranged from 0.51 to 0.97. No obvious seasonal trends were consistently present.

Mollusk survey

81. The Asian clam, Corbicula sp., and fragile paper shell clam, Leptodea fragilis, were the only two species collected at Cooks Bend. They were collected above the bendway on the right bank of the river near transect 120.

Fish

82. A total of 2427 fish was collected from Cooks Bend during the seven sampling periods. Fifty-two species were represented. The number of species collected during a sample period ranged from 16 to 27, and the number of individuals ranged from 117 to 774.

83. Gizzard shad and bluegill dominated the fish community of this bendway and comprised 19.3 and 18.3 percent of the total catch, respectively (Table 14). Their relative abundances fluctuated greatly among samples: for example, bluegill ranged from 1.4 percent of the catch in August 1979 to 41.3 percent of the catch in May 1980; gizzard shad ranged from 0.4 percent in August 1980 to 54.1 percent of the catch in August 1979.

84. Four additional species, blacktail shiner, threadfin shad, white crappie, and silvery minnow, each constituted more than 5 percent of the overall total catch. The blacktail shiner ranked third in relative abundance among the species occurring at Cooks Bend. This species was consistently present, but its relative abundance at any sampling period varied from 0.8 to 20.4 percent. Threadfin shad was the fourth most abundant species at Cooks Bend, comprising 8.9 percent of the total catch. Similarly to the other common species, its abundance varied considerably among sampling dates. White crappie comprised a relatively consistent percentage (6.7 percent) of the icthyofauna at this bendway. The sixth most abundant species, the silvery minnow, was the most erratic in its occurrence. It occurred on only five sampling dates and ranged from 1 to 112 individuals when present.

85. Three species, longear sunfish, largemouth bass, and bullhead

minnow, were consistent components of the Cooks Bend ichthyofauna. Black crappie, flathead catfish, and redear sunfish occurred often, but their patterns of occurrence were inconsistent. Four species constituted greater than 1 percent overall relative abundance but were extremely erratic in occurrence. Most notable in this group was the fluvial shiner, which comprised 4.4 percent of the catch at Cooks Bend but occurred in only the first and last samples.

86. Four species were unique to Cooks Bend. These were all rare, with alligator gar, brown bullhead, and flier each being represented by a single individual, and swamp darter by two.

87. Sportfish species dominated the ichthyofauna of Cooks Bend (36.5 percent). Three species, white crappie, black crappie, and bluegill, were captured in greatly increased numbers following severence of the bend. The two shad species (28.2 percent of the catch) and the minnows and shiners (26.9 percent of the catch) constituted significant portions of the fish community at this bendway. However, almost 70 percent of the minnows and shiners were collected during the final sampling period. Suckers, drum, and the catfishes comprised relatively minor elements of the fish fauna. Over three-fourths of all the catfishes were flathead catfish.

88. The mean number of species per station at Cooks Bend differed significantly among the positions only during August 1979 and June 1980 (Table 6). Significant differences were indicated for mean number of fish during December 1979 and for mean weight during June and August 1980. All significant differences were for electroshocking data; none were indicated for hoop netting. Despite the small number of significant differences observed among positions at Cooks Bend, a general pattern of position ranking was evident. The above-bendway stations most often had the highest mean values for C/f, C/y, and mean number of species per station. The within-bendway stations generally ranked second for the variables, followed closely by the below-bendway stations. The cut was available for sampling only during the final three efforts. During these periods, it ranked last in May and August and second in June.

89. Forty-two of 53 species of fish collected at this bendway by electroshocker and hoop nets were recorded from the within-bend position (Table 15). An additional five species were collected from this position by seine or minnow traps. Thirty and 27 were species recorded from the above- (Table 16) and below-bendway (Table 17) positions, respectively. Seining and trapping accounted for two and three additional species at these locations, respectively. Fifteen species were collected from the cut position (Table 18). The bendway position was more similar to the below-bendway position than to above the bendway. Twenty-eight species were shared, 20 were unique to the bend, and 2 were unique to the below-bendway stations.

Big Creek Bendway

Sediments

90. Considerable changes in bottom profile and sediment characteristics occurred at Big Creek Bendway following the cut off of the bendway (Figure 7). Immediately following the channel cut, a sand plug began forming at the junction of the river proper and the upper end of the bendway. The effect of this plug was to reduce and eventually to eliminate flow into the bendway at all except very high water levels. Sedimentation rapidly changed the substrate within the bend from a sand-gravel-fines mixture to one composed of nearly all fines.

91. The river transects at Big Creek Bendway were deepened and widened by maintenance dredging during summer 1979. Due to the dredging and because this river reach is influenced by the tailwaters of the Aliceville Lock and Dam, gravel and sand remained important components of the sediments.

Water quality

92. Table 19 contains mean values for the physical data collected at and below the surface during the study of Big Creek Bendway. Water-quality data collected at Big Creek Bendway indicated that several differences existed between river and bendway transects, although river stations above- and below-bendway were basically similar and within ranges expected due to instrument sensitivity and diurnal effects. The

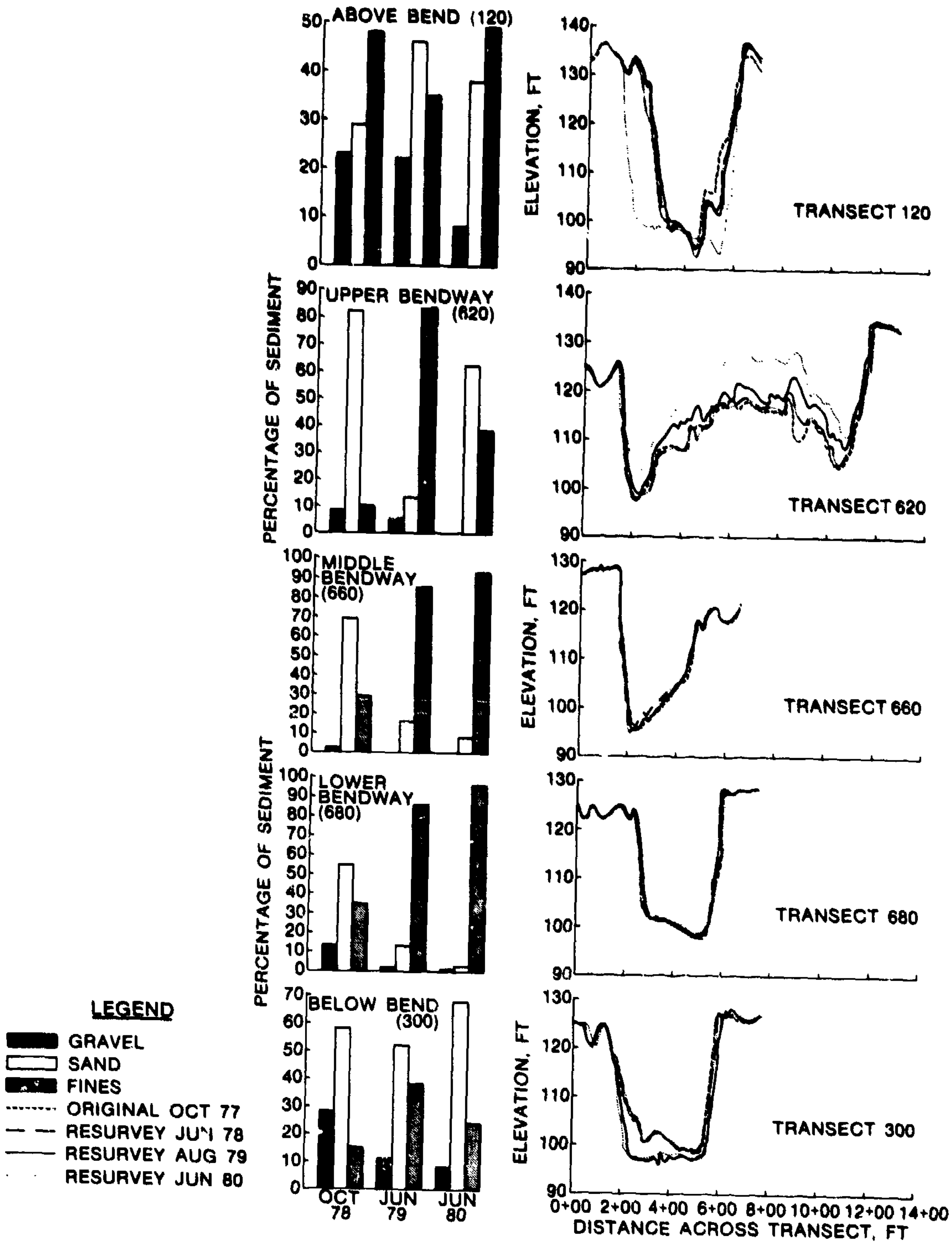

Figure 7. Sediment grain-size composition and depth profiles of five cross channel transects at Big Creek Bendway

most obvious differences occurred in temperature, DO, and conductivity data, but the differences were not consistent across sampling periods.

93. Within-bendway mean temperatures were significantly higher (approximately 2°C) than temperatures at river transects during December 1979 and early and late August 1980. Conductivity was significantly higher during all sampling periods except May 1980.

94. Surface DO levels were higher in river transects than in the bendway transects during December through June. During the remaining sampling periods, DO levels were similar in both areas. In terms of subsurface DO concentrations, river transects were nearly always higher due to stratification and oxygen depletion in the bottom strata of many bendway transects during July through September. DO in bottom strata never reached levels below 2.5 mg/ℓ, however.

95. Mean current velocity in the river transects exceeded that in within-bendway transects at all times except late August, when currents, were negligible at all transects. Currents reached peaks of 0.47 m/sec at the surface in river transects in May and subsurface currents peaked at 0.92 m/sec in December 1979. Currents in the cutoff bendway were less than 0.05 m/sec at all times.

96. River transects showed generally higher pH than within-bendway transects. The differences were small, however, with pH averaging 7.2 and 6.9, respectively.

97. River transects had greater Secchi visibilities than within bendway transects (Table 19). Visibilities in the bendway were low and ranged from approximately 0.23 to 0.48 m. During late August, however, river transects had mean Secchi visibilities of over 0.76 m.

98. The physical differences between river and bendway transects were apparently due to bendway closure created by a sand bar situated near the upper end of the bendway. None of the differences found could be expected to be stressful to biological communities. However, permanent cut off of the bendway from the main river channel could be expected to produce biological differences in the plankton, benthic, and fish communities.

Phytoplankton and
photosynthetic pigments

99. At Big Creek Bendway, the total number of organisms rose steadily from December to a high in early August and declined steadily through September (Figure 8). The division Chlorophyta was the dominant group and its greatest numbers occurred in early August. Chrysophyta populations increased sharply to a maximum in late July, followed by an equally sharp decline through September. Numbers of Chlorophyta and Chrysophyta were approximately equal in September.

100. The division Cyanophyta occurred in lesser numbers in this bendway than any of the other bendways and appeared to contribute less to the total plankton of the bendway. Blue-green algae reached peak abundance in late August. The division Euglenophyta was found in greatest abundance in this bendway and with the highest number occurring in early July.

101. Division Pyrrhophyta was not present in December or May samples but was found during all other sampling periods. Division Cryptophyta was found throughout the year with the exception of the late July sampling period. The dominant individual plankters at this bendway were diatoms, *Melosira* sp. and unidentified diatoms. Unidentified coccoids and *Trachelomonas* sp. (Euglenophyta) were third and fourth in dominance, respectively.

102. All pigment concentrations, excluding total chlorophyll, measured for Big Creek Bendway varied significantly over the sampling periods (Table 2). Significance of total phaeophytin was marginal.

103. Late July and late August samples at Big Creek Bend were higher in chlorophyll *a* concentration than other monthly samples. The months of December (0.156 mg/m^3) and May (0.175 mg/m^3) were characterized as having the lowest concentrations, while June, early July, early August and September had similar intermediate concentrations of chlorophyll *a*. Chlorophyll *b* values were low during December to late July, but steadily increased to highest concentrations in September.

104. No distinct peaks in carotenoid concentration were noted for Big Creek Bend over the seasons. The highest carotenoid concentration

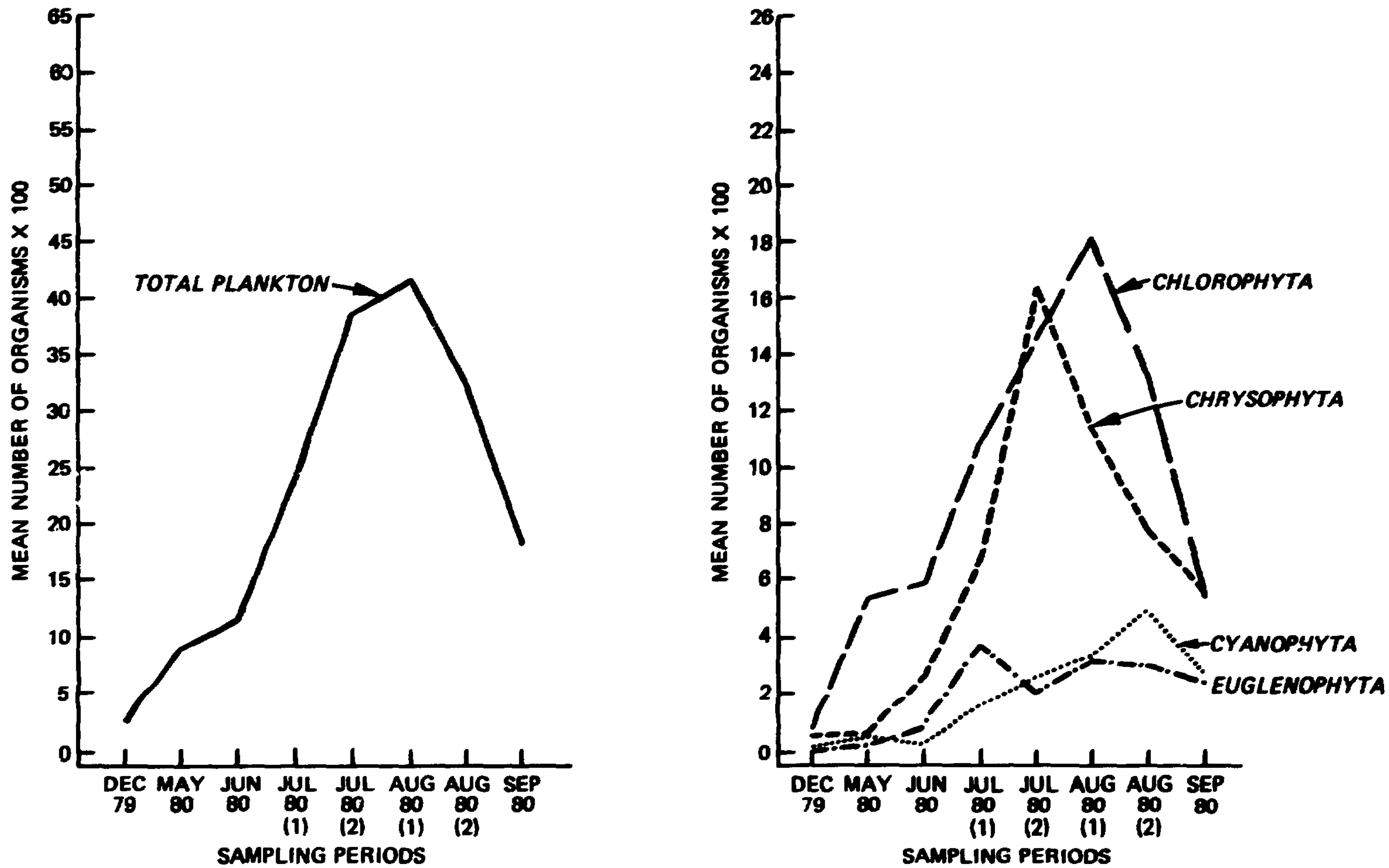

Figure 8. Mean number of total plankton and mean number of plankters by division from Big Creek Bendway, December 1979-September 1980

occurred in late July but values obtained for the months of June, early August, and late August were similar. The lowest levels occurred during December and May.

Aquatic macrophytes

105. Aquatic macrophytes were practically absent from this area. No aquatic plants were observed in the bendway, below the bendway, or in the cut. A few plants of arrowhead were found on a sand bar at the mouth of the bendway near transect 680. The only aquatic plant found above the cut was a small patch of water-willow just below transect 110.

Macroinvertebrates

106. Six families of macroinvertebrates represented more than 95 percent of the overall Big Creek Bendway collection (Table 20). These were Tubificidae 30.8 percent, Chironomidae 28.4 percent, Chaoboridae 25.0 percent, Ephemeridae 7.4 percent, Naididae 2.0 percent, and Ceratopogonidae 1.7 percent. Of these, only the Naididae was not represented in every seasonal collection. Families contributing 0.1 to 1.1 percent to the total collection were Glossoscolecidae (oligochaete worms); unidentified pelecypods (12 individuals); Sphaeniidae clams; Gammaridae; Heptageniidae and Caenidae (mayflies); Coenagrionidae (damselflies); Gomphidae (dragonflies); Polycentropodidae, Leptoceridae, and Hydropyschidae (caddisflies); Corixidae (water boatmen); Elmidae (beetles); and unidentified Diptera immatures. Only one to three individuals in the overall collection represented the Enchytraeidae, Haplotaxidae, Lubricidae, Lumbriculidae, Corbiculidae, unidentified Gastropoda, Talitridae, Asellidae, Sipholnuridae, Polymitarcyidae, Libellulidae, Perlodidae, Sialidae, Hebridae, Dytiscidae, Heteroceridae, Rhagionidae, Simuliidae, Psychodidae, Anthomyiidae, and Tabanidae.

107. Numbers of families, total numbers of individuals, and Shannon's diversity indices for each seasonal sampling effort are also presented in Table 20. While 44 macroinvertebrate families were represented in the Big Creek Bendway collections, the maximum collected at any one season was 22 (January 1979). The smallest number of families (14) occurred in the December 1979 and May 1980 collections. The largest number of individuals (1911) occurred in the July 1980 collection;

the smallest number (415) occurred in the May 1980 collection.

108. Shannon's diversity values for families ranged from 1.47 (August 1979) to 2.48 (January 1979). Overall diversity for the Big Creek collection was 2.41. Although the low value for the August 1979 collection was interesting, no obvious trends that could be correlated with season or high versus low diversity values were evident.

109. Family similarity indices (Jaccard's) indicated low to medium agreement between collections (Table 21). The 1979 collections showed 33.3 to 56.5 percent similarity, while 1980 collections were more consistent and ranged from 42.9 to 57.1 percent similarity.

110. The Morisita index (Table 21) appeared to show seasonal influence, i.e., collections from the same year showed trends that appear to correlate with season. Highest similarity occurred between May 1980 and June 1980 collections; lowest occurred between March 1979 and August 1979 collections.

111. Within-bendway stations at Big Creek had higher densities of benthic macroinvertebrates than above- or below-bendway stations in March, August, and December 1979 and May and July 1980. During these collecting periods, the significantly higher densities ranged from 2042 per m^2 (August 1980) to 214 per m^2 (May 1980). Lower densities associated with these collection periods ranged from 4.37 per m^2 (above-bendway stations, May 1980) to 631 per m^2 (below-bendway stations, July 1980). Generally, the above-bendway stations yielded fewer organisms than the below-bendway stations.

112. There was no major trend in terms of numbers of taxa per station, however. Within-bendway locations exceeded other bendway locations only in two of the seven sampling periods (March 1979 and May 1980). These numbers ranged from 1.45 taxa per m^2 (May 1980) to 9.12 per m^2 (March 1979).

Mollusk survey

113. The Asian clam, Corbicula sp., was the only clam listed in Table 38 that was not collected at Big Creek Bendway. Most specimens were collected at transects above the bendway. None were taken from the cut.

Fish

114. A total of 57 species and 4923 individual fish were collected from Big Creek Bendway. The fauna collected during a sampling effort at this bendway was quite variable: the number of species ranged from 17 to 42, and the number of individuals ranged from 348 to 1510.

115. Four species each accounted for over 5 percent of the total catch at this bendway. Gizzard shad dominated the fish community, averaging over 2.3 times the number of any other species (Table 22). Gizzard shad comprised a relatively consistent percentage of the catch at this bendway except during the first sampling period, when they constituted only 2.7 percent of the total catch. Blacktail shiners fluctuated in relative abundance from 0.3 to 40.1 percent of the catch at any sampling date. White crappie comprised 10.4 percent of the total catch and ranged from 2.8 to 21.6 percent of the catch during August 1979 and January 1979, respectively. Threadfin shad were not collected at Big Creek Bendway until the third sampling effort (August 1979), after which they comprised from 1.7 to 19.7 percent of the catch. Bluegill was the fifth most abundant fish species at Big Creek.

116. Some of the less abundant species such as the spotted gar, bullhead minnow, freshwater drum, black crappie, and largemouth bass made consistent, though small, contributions to the fish community of Big Creek Bendway. The relative contributions of others, notably the silvery minnow, quillback, and emerald shiner, were more erratic.

117. Six species were unique to Big Creek Bendway: southern brook lamprey, Alabama shad, bigeye chub, creek chubsucker, pirate perch, and white bass. Only a single individual of each species was collected.

118. Gizzard and threadfin shad, major forage species, comprised 36.8 percent of the Big Creek Bendway icthyofauna. Two other important forage groups, the minnows and shiners, and the suckers, comprised 21.9 and 5.8 percent, respectively.

119. Sport fishes, notably white and black crappie, largemouth bass, and bluegill, accounted for just over one-fourth of the individuals. Three species of catfishes and freshwater drum comprised only 2.8 and 0.7 percent, respectively, of the fish at this bendway.

120. Electroshocking data indicated significant differences in C/f per station during January, March, and December 1979 and August 1980 (Table 6). The C/y per station differed significantly in December 1979 and June 1980. Significant differences in the mean number of species per station occurred during January and December 1979 and August 1980. Data from hoop netting indicated significant differences among bendway positions during 1980 only. During May the C/f and C/y per station differed; C/f, C/y, and mean number of species per station showed significance in June; and C/f and mean number of species differed during August.

121. For C/f, C/y, and mean number of species per station, electroshocking data indicated a high-to-low ranking of positions corresponding to: within bendway, above bendway, within cut, and below bendway. Data derived from hoop netting suggested approximately the opposite ranking.

122. On the whole, the within-bendway and above-bendway stations were similar and the cut and below-bendway stations were similar. Cumulatively, more species were collected by electroshocking and hoop netting from the former two positions (43 and 41, respectively) than from the latter two (34 and 36 species, respectively). This same general pattern held for most individual sampling dates as well. Minnow trapping and seining accounted for five additional species at Big Creek Bendway, three from above the bendway (fluvial shiner, weed shiner, southern sand darter), three from within the bendway (ironcolor shiner, fluvial shiner, mimic shiner), and two from below the bendway (ironcolor shiner, fluvial shiner).

123. Within-bendway and above-bendway stations had overall similar species compositions (Tables 23 and 24). Thirty-five of 43 species recorded within the bendway also occurred above the bendway. Of the eight species unique to the bendway, six occurred only once, and only the bowfin was consistently present. Similarly, 35 of 41 species collected at the above-bendway stations also occurred within the bendway, and each of the six unique species occurred only once. The respective species compositions of these two positions among sampling dates were

quite variable, however. The number of species present at any one sampling date ranged from 6 to 25 above the bendway and from 10 to 35 within the bendway. Except for the May 1980 sample, more species were collected within than above the bendway. This may partly reflect the greater number of within-bendway samples, however.

124. Cumulative species compositions (Tables 25 and 26), and mean numbers, weights, and number of species per station (Table 6) were similar for the within-cut and below-bendway positions. Thirty-one of 41 species collected in these two areas were common to both. Six species were unique to the below-bendway stations and four to the cut.

125. A pattern of occurrence and abundance of fish species was observed at Big Creek Bendway which could be related to the isolation from the river of the upper portion of the bend. The isolation resulted from a sediment plug that formed during the early part of the investigation and blocked water flow into the bend portion of the bendway. In terms of numbers, species, and weight, the above- and within-bendway positions were similar during January 1979. These positions were not similar during the March 1979 sampling effort when the above-bendway and within-cut stations were similar. Only a single sample could be taken in these latter two areas, however, and thus the true means for these positions may have been considerably lower. Beginning with the third sample (August 1979), the above-bendway position became increasingly similar to the other two river channel positions and increasingly dissimilar to the within-bendway position. By the end of the investigation, the overall result was the partial separation of the fauna of this bendway into two components, one riverine and one lacustrine.

126. Big Creek was the only bendway at which significant differences occurred between the within-bendway stations and the river stations. Electroshocking indicated that C/f, C/y and mean number of species were consistently higher at within-bendway stations. Hoopnetting data indicated approximately opposite results.

Hairston Bend

Sediments

127. Hairston Bend sediments consisted of either sand or fines along the river margins and gravel and sand in the main channel (Figure 9). Little substrate alteration occurred at this bendway during the study. Three transects in the middle and lower bend portion did change to higher percentages of sand and fines and in two cases gravel was entirely eliminated from main channel stations. One station in the

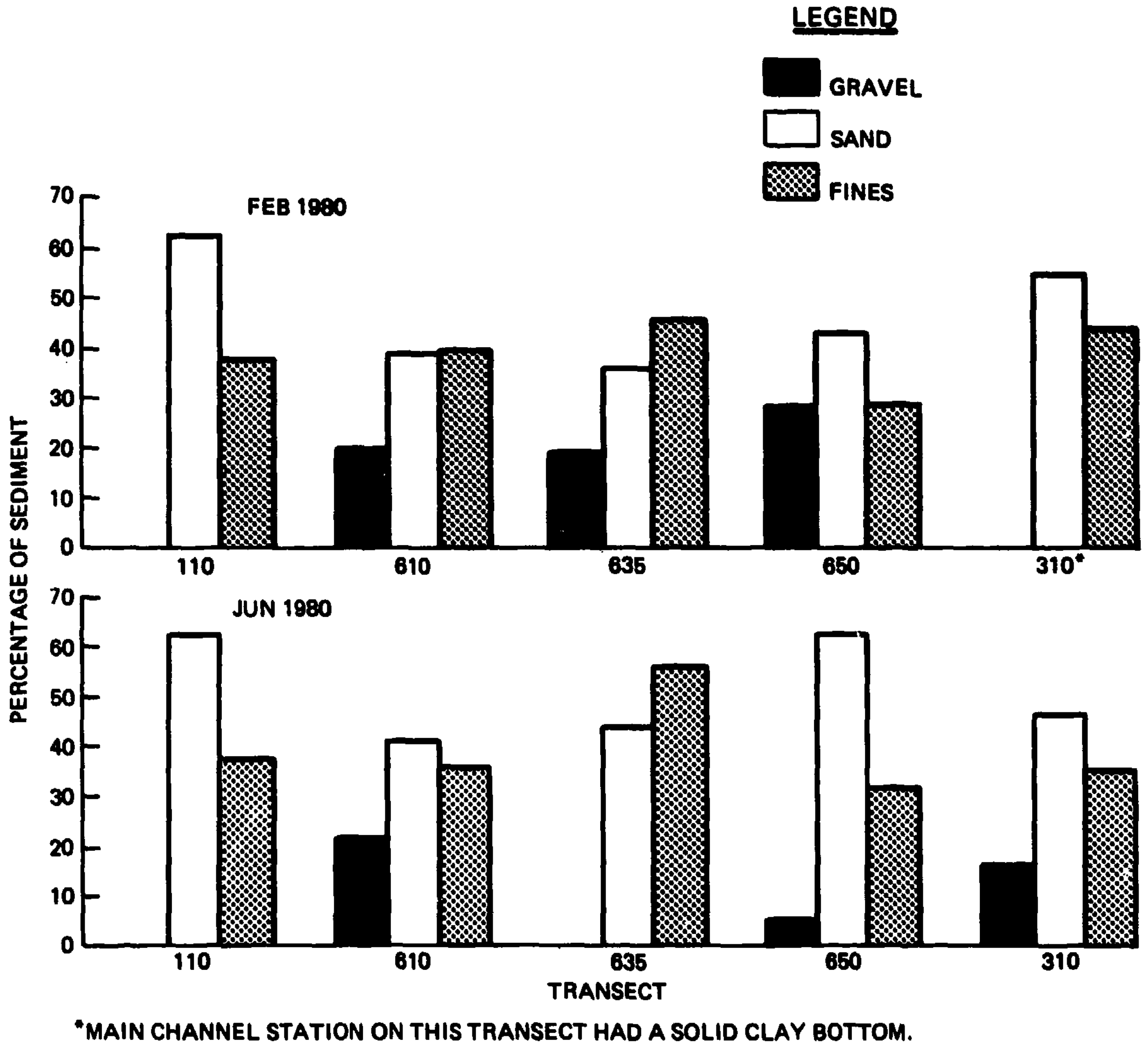

Figure 9. Changes in sediment composition at representative Hairston end transects

river below the bendway changed from a consolidated clay substrate to a gravel-sand-fines mixture. These changes were apparently due to channel modification activities in the river reach immediately above Hairston Bend.

Water quality

128. Table 27 lists mean values for data on physical variables collected at and below the surface at Hairston Bend during the study. Based upon the values recorded for temperature, DO, pH, and conductivity, no real differences in water quality were found for above, within- or below-bendway transects. Most values were within ranges expected due to instrument sensitivity and diurnal variation.

129. Current speeds were highest during December (overall mean was 0.62 m/sec) and decreased steadily thereafter. Currents were negligible from early July through September.

130. Temperature and DO concentrations varied seasonally. Temperature ranged from 6.7°C (December 1979) to 31.3°C (late August 1980). Levels of DO were above 9.0 mg/ℓ at all transects in December 1979 and were lowest overall in September 1980. Oxygen stratification and accompanying depletion occurred only during late August, when the DO of the bottom strata dropped to 3.7 mg/ℓ. Upper strata and surface levels rarely dropped below 5.0 mg/ℓ.

131. Within a sampling period, physical parameters were generally consistent among transects located above, within, and below the bendway. Within-bendway DO concentrations, however, were lower during early August 1980 than above-bendway DO levels. This occurred in connection with zero current velocities of surface waters during this sampling period.

Phytoplankton and photosynthetic pigments

132. The lowest total populations of organisms were observed in December. The numbers increased to a secondary peak in June, decreased to late July, and reached a maximum in late August. A distinct decline in total numbers was seen in the September samples (Figure 10).

133. The dominant group of organisms throughout the year was Chlorophyta. Chrysophyta and Cyanophyta were almost equal in importance

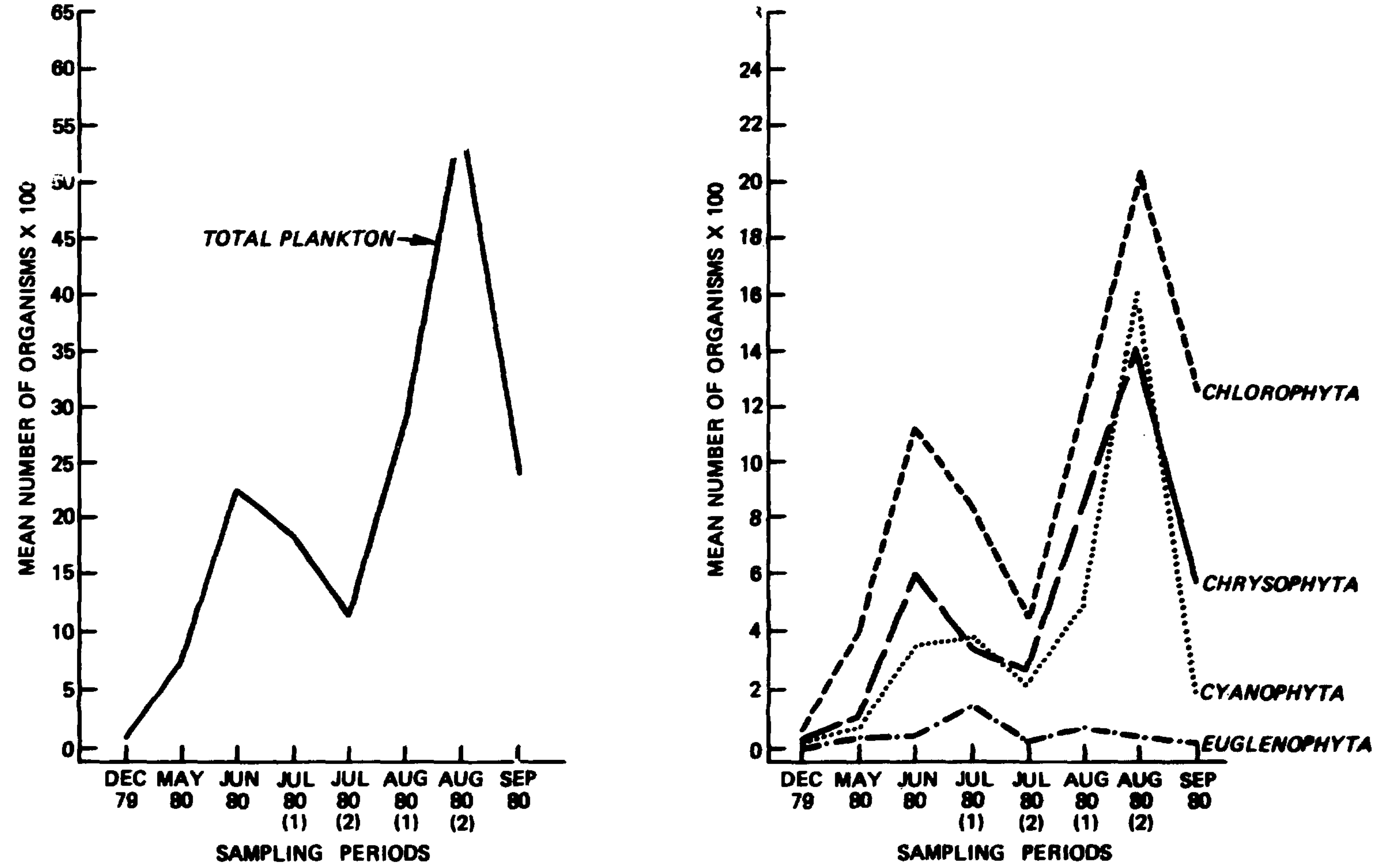

Figure 10. Mean number of total plankton and mean number of plankters by division from Hairston Bend, December 1979–September 1980

with Chlorophyta and showed greater numbers except at the late August sampling period.

134. The division Pyrrhophyta was not observed in the December and May samples but was found at later sampling times. Division Cryptophyta was present in all except September samples with the peak population occurring in June. At this bendway the dominant individual plankter was a blue-green algae, Oscillatoria sp. The diatom, Melosira sp., was a close second followed by a green algae, Palmelococcus sp.

135. All pigment concentrations for Hairston Bend varied significantly over the sampling periods (Table 2). Chlorophyll a exhibited two peaks, one in June (1.11 mg/m^3) and a second in late August (1.13 mg/m^3). Values increased during May, peaked in June, decreased to late July, increased again and peaked during late August, then declined.

136. Concentrations of chlorophyll b were low and were statistically similar over the seasons except during September. Chlorophyll b estimates increased from late July, peaked during September at 0.79 mg/m^3 and decreased thereafter.

137. Maximum carotenoid concentrations (SPU) were recorded during late August. Carotenoids during June and early August were significantly different from other periods, also. Concentrations during these months were higher, representing secondary peaks.

Aquatic macrophytes

138. Duckweed (Lemna spp. and Spirodela spp.) and coontail were found to be common below transect 640. Normally, these plants would not be found in the river channel. At the time of the survey, the river was on the rise and these plants may have been flushed out of still backwater areas.

139. Water primrose (Ludwigia spp.) was the only aquatic macrophyte found to be common in Hairston Bend. However, it was not extensive. It was found in small patches near transects 100 and 110, near the head of the proposed cut, and in the area below the proposed cut. Nowhere was water primrose found to extend into the water.

Macroinvertebrates

140. Table 28 lists the dominant macroinvertebrate families

represented in the overall Hairston Bend collection. In all, 35 families and 4917 individuals were collected. Of these, 8 families comprised 92.2 percent of the collection. Three families (Chironomidae, Chaoboridae, and Tubificidae) were consistently represented in all seasonal collections and accounted for over 50 percent of the benthos collected at this location.

141. Hydropsychidae, the caddisflies, were represented in 86 percent of the seasonal collections and contributed 28.8 percent to the overall Hairston Bend collection. Other major contributors were the Caenidae (mayflies) Naididae (oligochaete worms), Ceratopogonidae (biting midges) and Ephemeridae (burrowing mayflies). Individually, each of these groups accounted for 2 to 5 percent of the overall collection.

142. Families contributing generally less than 0.3 percent (14 or 15 individuals) to the overall Hairston Bend collection were: 3 families of worms (Enchytraeidae, Lubricidae, and Lumbriculidae); 3 families of molluscs (unidentified pelecypods, Pleuroceridae, and Planorbidae); one crustacean family (Gammaridae); and 14 aquatic insect families. The insect families were Siphlonuridae, Polymitarcyidae, Coenagrionidae, Macromiidae, Perlodidae, Perlidae, Sialidae, Corixidae, Elmidae, Dytiscidae, Heteroceridae, unidentified Diptera, Simuliidae, and Anthomyiidae.

143. The numbers of families collected through seasons varied from 12 to 22. Collections for January and March 1979 contained the smallest number of families (12) while the May 1980 collections contained the largest numbers of families (22). The smallest number of individuals (49) was collected in December 1979 whereas the largest number (1793) was collected in August 1979 and was due to an increased abundance of Potamyia flava (Hydropyschidae).

144. No obvious trends could be seen between seasonal collections when compared by family diversity values. Mean family diversity for the overall Hairston Bend collection was 2.8; individual seasonal collections varied from 1.68 (August 1979) to 2.7 (June 1980). The unusually

large number of P. flava individuals apparently influenced the diversity value for the August 1979 collection.

145. While diversity values were relatively consistent across seasons, collection similarities varied between seasons at Hairston Bend (Table 29). Jaccard coefficients were relatively low across seasons, ranging from 19.2 percent (March 1979/July 1980) to 72 percent (June 1980/July 1980). In general, collections made in 1980 showed higher family similarity than those from 1979. Morisita's indices showed the same trends.

146. Duncan's Multiple Range Test showed that average macroinvertebrate density was similar across stations at Hairston Bend during each season, regardless of position of station relative to the bendway. Average density per station ranged from 6.61 per m^2 (May 1980) to 1175 per m^2 (August 1979) for above bendway stations; 3.39 (December 1979) to 661 per m^2 (July 1980) for below bendway stations. Duncan's Multiple Range Test also showed that the number of taxa collected from below-bendway stations was higher than that from above- or within-bendway stations in July 1980. Mean numbers of taxa for above-bendway stations ranged from 1.70 (May 1980) to 8.13 (August 1979); 1.55 (December 1979) to 661 per m^2 (August 1979) for within-bendway stations; and 1.45 (December 1979) to 13.80 (July 1980) for below-bendway stations. There were no obvious trends in terms of densities of organisms or number of taxa collected from different sections of the Hairston Bend bendway during the study.

Mollusk survey

147. No clams were collected from Hairston Bend during the survey of September 1980.

Fish

148. More species (59) of fish were collected at Hairston Bend than at any other bendway. However, the total number of individuals (2267) was lowest. The number of species collected during a sampling effort ranged from 18 to 31, and the number of individuals from 121 to 467.

149. The Hairston Bend icthyofauna was dominated by the

essentially riverine minnows and shiners (Table 30). Four of the five most abundant species belonged to this group of fishes. The blacktail shiner was the most abundant species (23.9 percent of the catch), followed by the silvery minnow (13.0 percent of the catch) and bullhead minnow (7.2 percent of the catch). These species were present at every sampling date, and their numbers and relative abundance varied widely. Although the silverstripe shiner constituted 6.2 percent of the total fish collected and was the fifth most abundant species overall, it was present at only five sampling dates and was relatively numerous only during June 1980.

150. Bluegill was the fourth most abundant species, comprising 6.3 percent of the total. Bluegill numbers varied from 1 to 41 per sample date, and their relative abundance ranged from 0.2 to 14.4 percent. This species was collected at all sampling dates.

151. Ten species collected only at Hairston Bend further accented the differences between this bendway and the others. Species inhabiting riffles, or swift deep runs with clean substrates, (such as stoneroller, speckled chub, black and golden redhorses, crystal and dusky darters, and logperch occurred only at this bendway. The chestnut lamprey and pretty shiner occurred only at Hairston Bend, but their specific habitat needs were unclear. Although the ten species were obtained in low numbers, their particular microhabitats make them difficult to collect, and their true relative abundances were probably underestimated.

152. Gizzard and threadfin shad comprised only 9.1 percent of the Hairston Bend ichthyofauna, whereas minnows and shiners comprised 52.6 percent. Nine species of suckers were collected, comprising 4.1 percent of all fishes. The principal sport fishes made up a relatively small portion of the fauna, only 14.9 percent. These species, largemouth bass, bluegill, and black and white crappie, achieve their highest abundances in lentic systems; thus, their relative scarcity at this bendway is not surprising.

153. Significant differences among bendway positions occurred on four of the seven sampling dates (Table 6). Electroshocking indicated significant differences in mean number of species per station during

January 1979 and in C/f in May and June 1980. No consistent high-to-low ranking of the three bendway positions (Hairston Bend had no cut portion during this study) was apparent.

154. Hoop netting indicated significant differences in C/f, C/y, and mean number of species per station during January 1979 and for C/f and mean number of species during March 1979. The ranking during these periods was: below-bendway, above-bendway, within-bendway. During May 1980 significant differences were noted for C/f ranked as: above-bendway, within-bendway, below-bendway.

155. Considerably fewer species were collected by electroshocker and hoop nets at the below-bendway position (30) than at either the above- (35) or within-bendway (38) positions (Tables 31-33). At Hairston Bend six additional species were collected by seining from above the bendway, and five additional species from within the bendway. All were represented by very few individuals (Table 30). The positions were all quite distinct, however. Only 23 of 59 species collected at Hairston Bend were found in all three positions. Eleven species were collected only above the bendway, three only below the bendway, and 13 only within the bendway. The constantly shifting ichthyofaunas of the three positions at Hairston Bend is apparent from a comparison of their respective species complements over time. Above the bend the number of species collected at a sampling date ranged from 5 to 22. Only six species were collected at four or more times, and no species occurred in every collection. Ten of the 11 unique species were present only once. From 5 to 15 species per sampling date were collected below the bend. Only four species occurred four or more times and no species occurred at every sampling date. All three unique species occurred only once. Fourteen of 43 species collected within the bend occurred at four or more times, but only two (blacktail shiner and longnose gar) were always present. Of the 13 species unique to this position, only one was found at more than one sampling period.

PART V: EVALUATION OF CUTOFF BENDWAYS

Sediments

156. Sand and fines comprised most of the substrate at all bendways. Gravel was an important component at some transects, however, particularly at Big Creek Bendway and at most Hairston Bend midchannel transects. In most areas sand and fines were replacing the gravel due to sediment accumulation following current reduction. This effect was most pronounced at Big Creek within-bend transects. Of the three bendways where channel cuts were complete, gravel had remained an important component of the substrate only at Big Creek Bendway river transects. This was due both to maintenance dredging and to the influence of the Aliceville Lock and Dam tailwaters.

157. All bendways showed some degree of filling in the upper within-bendway areas. At Rattlesnake Bend and Cooks Bend, the filling has been gradual and relatively slight. At Big Creek Bendway, however, a sand plug formed rapidly following completion of the channel cut and effectively separated the bend and river portions. Some sedimentation was also apparent at middle and lower within-bend transects.

Water Quality

Current velocity

158. During December, May, and June, Hairston Bend had much higher current velocities at within-bendway transects than did Big Creek Bendway, Cooks Bend, or Rattlesnake Bend. Current velocities for Hairston Bend were more nearly like the other bendways for river transects, however, and were actually somewhat lower than river currents at Big Creek Bendway during May. Hairston Bend was not cut off during this study; thus, water flow was apparent throughout. The other three bendways were cut prior to or during the study, diverting most of the flow from the bend sections. In addition, with the exception of the river portion of Big Creek Bendway, the bendway currents in the river

downstream of Hairston Bend were further reduced due to pooling following lock and dam construction.

Dissolved oxygen

159. Overall, Rattlesnake Bend and Cooks Bend had the highest mean surface DO levels (8 mg/ℓ), while Big Creek Bendway and Hairston Bend were lower (7 mg/ℓ). However, there was considerable variability in their relative DO levels among seasons. There was less distinction among bendways in subsurface DO levels.

160. The river portions of Rattlesnake Bend, Cooks Bend, and Big Creek Bendway had similar overall surface DO levels. Hairston Bend had significantly lower concentrations at most, but not all, times. In terms of subsurface DO levels, Big Creek Bendway showed consistently and significantly higher DO levels than the other bendways, which were similar to each other.

161. Surface DO levels for Rattlesnake Bend, Cooks Bend, and Hairston Bend within-bendway transects approximated those in their river portions. Big Creek Bendway had considerably lower DO levels at within-bendway transects. For subsurface data, the relative levels and changes were similar to those for the surface data. The actual DO values decreased, however, due to oxygen depletion in the bottom strata at most within-bendway transects.

Temperature

162. Hairston Bend was consistently cooler overall at each sampling date than the other bendways. The difference was greatest in late July when surface and subsurface mean temperatures at Hairston Bend were 2.2 and 1.7°C below the next coolest bendway, respectively. Rattlesnake Bend, Cooks Bend, and Big Creek Bendway had similar overall temperatures at each sampling period except December, when Big Creek was somewhat warmer.

163. River transects showed essentially the same pattern of differences as the overall bendways, except that Big Creek was separated from Rattlesnake and Cooks Bends in having a slightly lower overall mean temperature. Within-bendways transects were generally warmer than river stations at all times at all bendways except Hairston Bend. Big Creek

Bendway had much higher within-bend temperatures during December than any other bendway; this accounted for its overall difference during December.

pH

164. Averaged over all bendways, pH increased steadily from a low during December to a general peak in July and August. Values for September showed a general decline. Surface pH was slightly higher than subsurface pH at most times.

165. Rattlesnake Bend had consistently much higher pH levels than the other bendways from July through September and overall. As noted in paragraph 93, Big Creek was the only bendway to show significant (and consistent) pH differences among transects; river transects had higher pH levels than did within-bendway transects. The pHs measured at Hairston Bend and Cooks Bend were erratic.

Turbidity

166. Big Creek Bendway showed significantly lower Secchi visibilities than the other bendways. This bendway was the only one at which significant transects differences occurred. River transects were clearer than within-bendway transects during summer phytoplankton peaks.

167. Hairston Bend and Big Creek Bendway were considerably more turbid than Cooks Bend and Rattlesnake Bend at any sampling period. No significant differences among transects were observed for any single bendway.

Conductivity

168. For all bendways, conductivity was lowest in December and May and increased constantly from June through September. Rattlesnake Bend was slightly higher than the other bendways for river transects. Big Creek had considerably higher within bendway conductivities than did all other bendways.

Ammonia-nitrogen

169. No significant differences for river stations, either within or among bendways were found for ammonia-nitrogen concentrations. Within-bendway stations showed Hairston Bend to be significantly higher than all other bendways in August by 5 to 278 times. This large single

difference probably caused the overall significant differences between the bendways. This may have resulted from measurement error or from a localized phenomenon of unknown origin.

Carbon dioxide

170. Hairston Bend and Big Creek Bendway had higher carbon dioxide concentrations than did Cooks Bend or Rattlesnake Bend. Measurements at Big Creek were especially high at within-bendway transects.

Alkalinity

171. Big Creek Bendway had higher total alkalinity than all other bendways.

Phosphorus

172. Big Creek had higher total phosphorus than the other bendways, with the greatest differences occurring in the river transects. No individual bendway showed any significant differences among transects, however, at any sampling period.

Orthophosphorus

173. Overall, Hairston Bend and Big Creek showed higher orthophosphorus concentrations than did Cooks Bend or Rattlesnake Bend. Although the differences were not always significant, differences were consistent for both surface and vertical profiles at most sampling dates. No individual bendway showed significant differences among transects at any time.

Phytoplankton and Photosynthetic Pigments

174. Phytoplankton populations were greater at within-bend stations than in river stations at Big Creek Bendway and Cooks Bend and approximately equal at all transects at Hairston and Rattlesnake Bends. There were only small overall differences in the overall kinds and abundance of plankton at the four bendways, however. Plankton populations showed a seasonal pattern of low number in December and peak numbers in August.

175. Chlorophyll concentrations were similar at Hairston and Big Creen Bendway and slightly higher than concentrations at Cooks and

Rattlesnake Bends. Big Creek Bendway had the second highest peak concentrations of chlorophyll a and b of all bendways. These pigment values were similar to, but lower than, those recorded at Hairston Bend. Chlorophyll a values at Hairston Bend reached an initial peak earlier in the year than at other bendways. Cooks Bend values were similar to Rattlesnake Bend for chlorophyll a and carotenoids. Both of these bendways exhibited peak chlorophyll a concentrations in July and early August; peak carotenoid values were obtained during early August. Cooks Bend had the lower concentrations of chlorophyll b.

Aquatic Macrophytes

176. Aquatic macrophytes were scattered and uncommon in the four bendways. Most commonly encountered was water-willow, which formed small, though numerous, beds in Rattlesnake Bend. Development of macrophytes can be expected in portions of the waterway where sedimentation creates shallow organic-matter-enriched habitats (Boyd 1971, Hynes 1971). Wilkinson (1973) noted that this had occurred in cutoff oxbows along the Kissimmee River in Florida.

177. Although not as well studied as other biological aspects of river systems, macrophytes appear to form an important component of aquatic ecosystems (Boyd 1971, Haslam 1978, Modde and Schmulbach 1973, Schmulbach 1974, and Westlake 1975). They provide fish and invertebrate shelter and substrate stabilization and may greatly influence nutrient cycling (Boyd 1971).

Macroinvertebrates

178. During this study 60 taxa of macroinvertebrates were collected. A list is presented in Table 34.

Density

179. Overall, no consistent pattern in densities of macroinvertebrates was found when all bendways were compared. All other bendways, for example, exceeded Hairston Bend densities in January and December

1979; all bendways had similar densities in August 1979 and July 1980. Rattlesnake Bend densities exceeded those at Hairston Bend in May 1980, but Cooks Bend and Big Creek Bendway were similar to both Rattlesnake Bend and Hairston Bend. The reverse was true for June 1980 collections when Big Creek Bendway densities exceeded those at Cooks Bend, but neither was separated from Rattlesnake Bend or Hairston Bend.

180. Similar results were obtained when number of taxa was compared by bendway. All bendways were similar in number of taxa collected in May, June, and July 1980, and August 1979; Hairston Bend collections contained fewer taxa than all other bendway collections in December, March, and January 1979.

181. Seasonal collections from individual bendways, in general, showed considerable variation in both numbers and kinds of macroinvertebrates at each bendway location. Since a ponar grab sampler was used as the collection device, this kind of variation was not unexpected. The organisms collected in this study, however, should be primarily those associated with the bottom substrate of a particular bendway. It has long been recognized that variability is introduced into such collections by a number of physical variables over which the investigator has no control. These variables include, but are not necessarily limited to, heterogeneity of bottom type (sand, gravel, fines, and combinations of substrate), water depth, water quality, and condition of specimens in the samples.

Community association

182. In an attempt to compare bendways by their macroinvertebrate fauna, seasonal collections were combined to create an overall collection representative of a given bendway. These pooled collections, therefore, represent the macroinvertebrate community associated with the substrate of a bendway. In addition, each bendway collection was fractioned into three groups according to relative importance of each family:

a. Dominant - families in which each contributed 2 percent or more of the macroinvertebrates in at least one bendway collection. The dominant family assemblage can be expected to consist of those macroinvertebrates most frequently encountered in larger abundance and would be expected to be typical river benthic types.

b. Common - families in which each represented between 0.1 and 1.2 percent (maximum) in at least one bendway collection. The common assemblage would represent less frequently encountered but still typical benthic types. This assemblage should represent organisms that have at least partial association with the microhabitat conditions associated with river substrates.

c. Rare - families in which only one to four individuals were collected sometime during the study, regardless of bendway. The rare assemblage should represent organisms either not typically associated with river bottoms or those so sparsely represented in the collections that precise identification was difficult or impossible based on lack of adequate material. In the rare family assemblage, taxonomic problems could be significant. Because of these problems, this part of the overall collections has little analytical value.

183. Based upon total bendway collections (i.e. totals of seasonal collections for each bendway), a consistent family assemblage of macroinvertebrates characterized all bendway collections considered in this study. Table 35 lists the dominant families and the percent occurrence of each family for each bendway. In all, nine families accounted for 93.5 (Hairston Bend) to 97.2 percent (Big Creek Bendway) of the benthos collected during this study of the Tombigbee River.

184. While the dominant family assemblage was consistent across bendways, the importances of given families within the assemblage varied between bendways and appeared to reflect physical conditions associated with the bendways. For example, two groups known to be associated with sand-silt substrates contributed substantially to benthic associations at Rattlesnake Bend. Both Sphaeriidae (fingernail clams) and Ephemeridae (burrowing mayflies) are known to prefer silt-laden substrates. Fuller (1974) pointed out that *Sphaerium* (Sphaeriidae) is especially tolerant of impoundments and Grantham (1969) suggested that sphaeriids have value as indicators of environmental disturbance. Similarily, *Hexagenia* (Ephemeridae) is generally associated with the soft mud bottoms of lakes and sides of rivers (Fuller 1974). Although the Tombigbee typically possesses a respectable population of *Haxagenia* (Howell et al. 1978), Rattlesnake Bend collections were characterized by a consistent occurrence and high abundance of this species, which suggests that the

substrate of Rattlesnake Bend is more uniformly silted than that of the other bendways.

185. Another group (Chaoboridae) not generally included as benthos are included in these data because of their general life style and its implications. Phantom midges are characteristically associated with standing water and should not be abundant around swiftly moving water. Table 35 illustrates a major contrast between Hairston Bend, which remained open to Tombigbee River water flow during this study, and other bendways that were either closed off entirely before this study or altered during the study. Phantom midges accounted for only 3.1 percent of the Hairston Bend collections, but they comprised between 21.2 to 25 percent of collections at other bendways.

186. One other dominant family of bendway benthos, the Hydropsychidae, may also be indicative of existing environmental conditions at the four bendways. At Hairston Bend this family was present in great abundance, especially when compared to its occurrence in other bendway collections. Howell et al. (1978) considered representatives of this family to be indicative of natural river conditions. In this study, however, hydropsychid importance in the Hairston Bend collection was due to an inordinate number of individuals that appeared in the August 1979 collection. Nevertheless, inspection of bendway collections showed that members of this group were consistently represented by larger numbers at Hairston Bend that at other bendways. Rattlesnake Bend collections, in fact, contained only 10 individuals of this group.

187. Table 36 lists the percentage occurrence of common macroinvertebrate families that occurred in small but consistent numbers in bendway collections. A majority of these families are either typically or partially associated with river substrate, i. e., three families of worms, six families or groups of mollusks, and four families of crustacea. While some families of insects are typical of river substrates (Macromiidae and Gomphidae), others are simply typical of silty river water such as that found in the Tombigbee and would be expected to be present in benthic collections. Other methods of collection would likely reveal many of these families to have greater importance in other

river microhabitats. While the quantitative value of these groups is limited, the qualitative value is significant.

188. Table 37 contains a listing of rare families encountered within-bendway collections. These families were represented by only one to four individuals and, overall, made insignificant contributions to the total collection at any bendway. While some are obvious benthic dwellers (worms and mollusks), most of the insects are associated with other habitats within the Tombigbee. Their occurrence in benthic samples is probably due to chance. As pointed out earlier, precise identifications for members of this group were more difficult due to the small numbers and/or physical condition of the specimens.

Similarity

189. Figure 11 illustrates Jaccard similarity indices for bendway

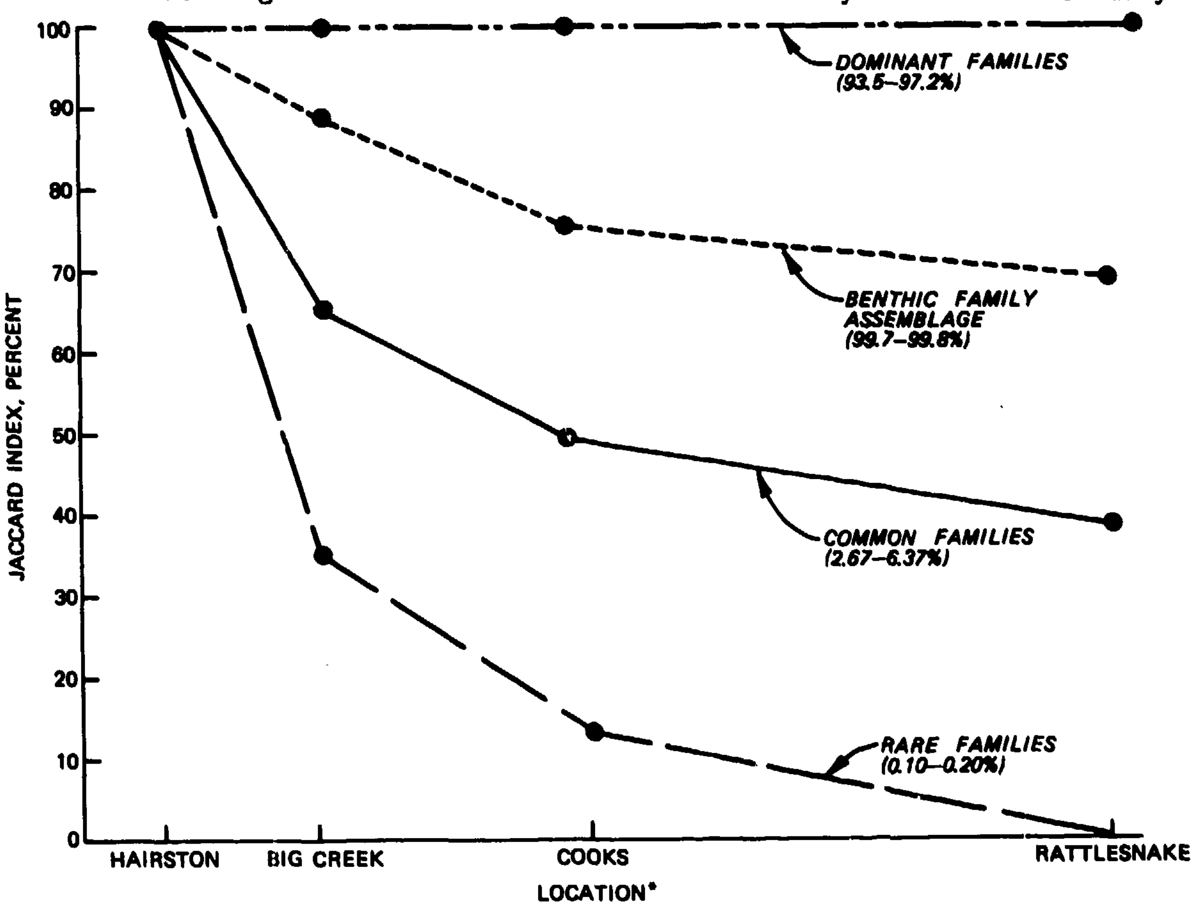

Figure 11. Jaccard's similarity comparisons. All bendway collections vs Hairston Bend collection. *Locations plotted by river mile relative to Hairston Bend

collections broken down by percentage occurrence as compared to the Hairston Bend collection. Dominant families of the bendways showed perfect similarity (100 percent), regardless of bendway comparison. All bendway collections contained representatives of these nine families. Common and rare families appeared to show trends that relate the proximity of bendways to each other. For common families, highest Jaccard similarity (64.9 percent) occurred between Hairston Bend and Big Creek Bendway collections; lowest similarity (37.5 percent) was between Hairston Bend and Rattlesnake Bend collections. Qualitatively, this suggests that macrobenthic fauna tended to vary by river mile; i.e., the closer two bendways were to each other, the more similar their macrobenthic fauna.

190. The Morisita index suggested a closer relationship to date of bendway cutoff, particularly for dominant families (Figure 12). This

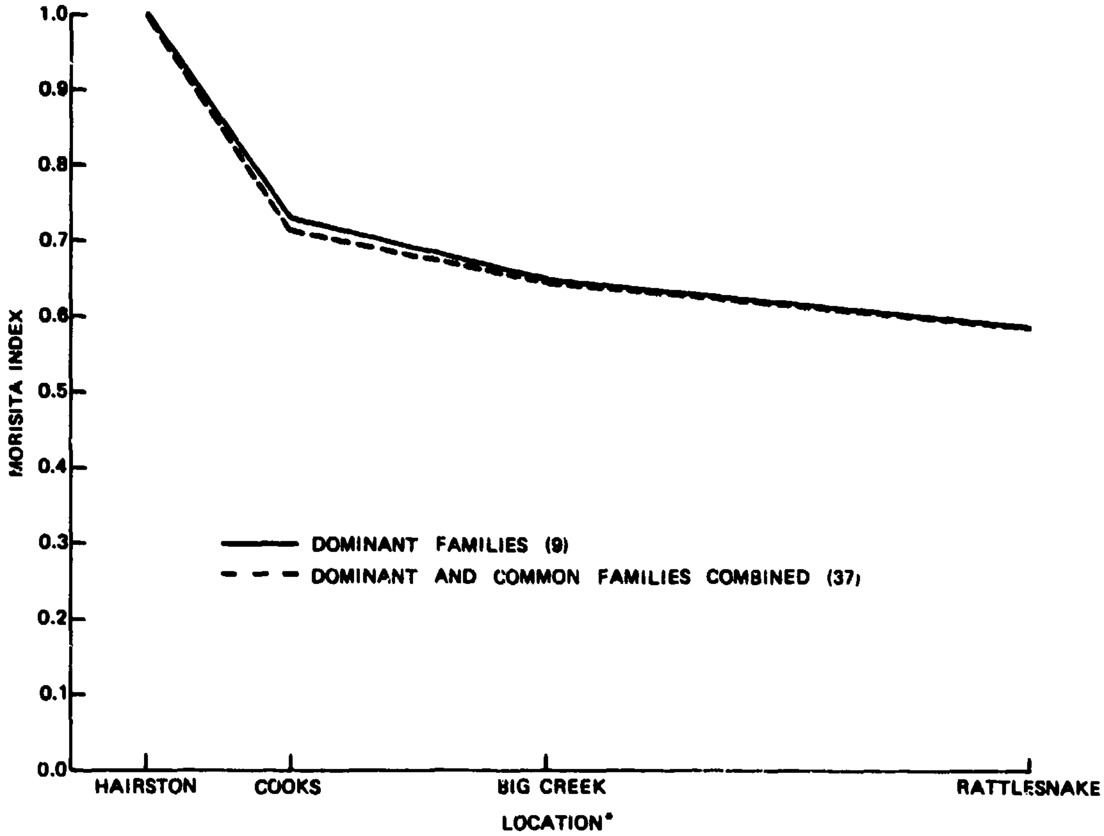

Figure 12. Morisita's similarity comparisons. All bendway collections vs Hairston Bend collections. *Locations plotted by time of cut off relative to Hairston Bend

relationship appeared to be strengthened when dominant and common family groups at Hairston Bend were combined and compared to the same groups in other bendway collections. In all bendway collections, dominant and common families accounted for more than 99 percent of the macroinvertebrates collected during the study. Figure 12 illustrates a trend of decreasing similarity between benthic communities and the date of bendway cutoff. Big Creek Bendway and Cooks Bend collections were almost identical (0.97). Both bendways are of similar length (3 versus 4 miles) and are the two most recently cut off from the main river channel. Rattlesnake Bend collection was, in turn, highly similar to both Big Creek Bendway and Cooks Bend collections (0.88). Collections from cutoff bendways were, therefore, more similar to each other than any were to the Hairston Bend collection. As indicated in Figure 12, Hairston Bend collection showed highest similarity to Cooks Bend collection (0.72), the bendway most recently cut off (January 1980); next highest (0.65) to Big Creek Bendway, cut off during winter 1978; and was least similar to Rattlesnake Bend (0.59), which was cut off in 1975.

191. Similarity indices, therefore, indicate that the benthic communities from bendway locations were qualitatively very similar; components or families present tend to vary by river mile. Quantitatively, however, differences appear to be due to differences in dominance of several families, which, in turn, can be related to date of bendway cut off. Among these collections, differences in dominance existed between Ephemeridae (burrowing mayflies), Chaoboridae (phantom midges), Sphaeridae (fingernail clams), and Hydropyschidae (caddisflies).

<u>Family diversity</u>

192. Overall bendway family diversity remained fairly high across sampling seasons and, in general, did not show extreme trends in reduction of family diversity. Figure 13 illustrates overall seasonal collection family diversity. Hairston Bend, Big Creek Bendway, and Cooks Bend collections were equally depressed during August 1980. Rattlesnake Bend collections remained fairly uniform throughout the study period. Big Creek collections showed lowered family diversity values during the last three sampling periods.

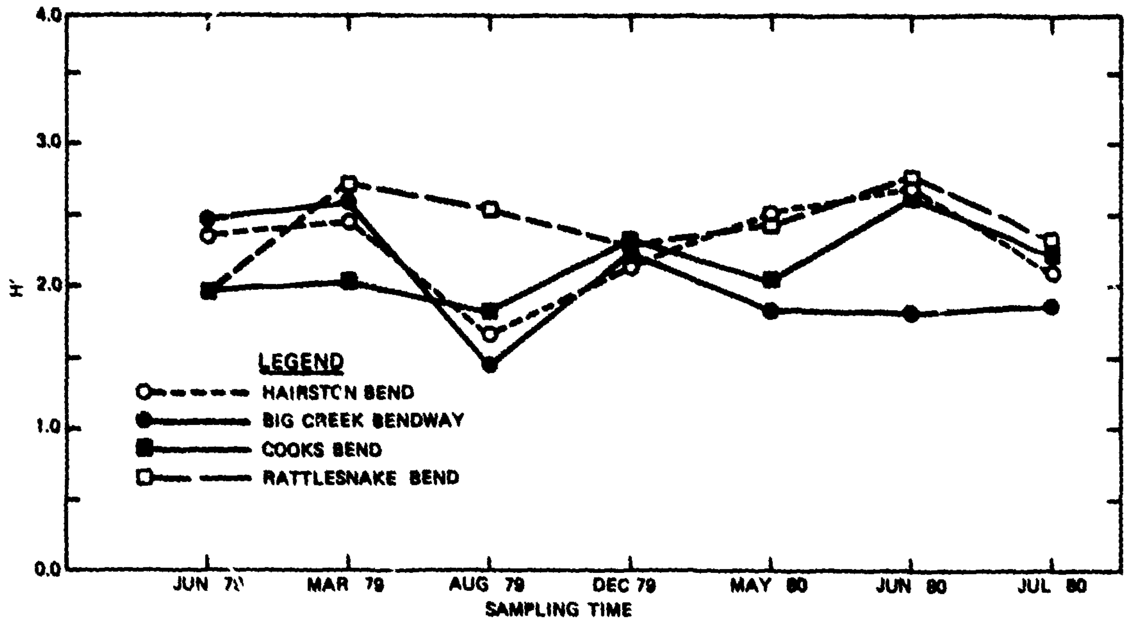

Figure 13. Family diversity values for bendway collections by seasons

Mollusk Survey

193. A total of 18 species of Unionidae plus the Asian clam Corbicula were taken during the survey (Table 38). Specimens were collected at three of the four bendways; no mollusks were collected in samples taken at Hairston Bend. A single Quadrula quadrula (maple leaf) was collected using the brail at Transect 220 in the cut of Rattlesnake Bend. A single living Fusconaia ebena was hand-collected in shallow water on a sand bar on the left bank near transect 680 on Big Creek Bendway.

194. Two complete Pluerobema sp. shells were taken at Big Creek Bendway. Based upon specimens in the Mississippi Museum of Natural History, and through discussions with Dr. David Stansbery of Ohio State University, these specimens were identified as Pleurobema taitianum and P. marshalli. The rough pigtoe, Pleurobema plenum, is listed as endangered for the Tennessee River drainage area by the U. S. Department of the Interior (1976). In addition, P. curtum, P. taitianum, and P. marshalli are under status review (U. S. Department of the Interior 1980). All are within the reported range of this section of the

Tombigbee River. With the exception of the shells of Pleurobema sp., no particularly uncommon species were taken from the Tombigbee River.

Fish

195. During the study, 14,300 fish were collected representing 78 species and 20 families. The list of families and species collected is presented in Table 39. Both scientific name and common name as accepted by the American Fisheries Society (1980) are listed.

196. Recent studies (Boschung 1973, Caldwell 1969, Smith-Vaniz 1968) have reported a total of 116 fish species from the Tombigbee River system of Mississippi and Alabama. An atlas of freshwater fishes of North America (Lee et al. 1980) lists 112 species. Both of these lists include marine species that occasionally stray into fresh water. In the present study, one specie not found on either list were collected. It was the striped mullet.

197. The number of species collected was greatest during January (52), March (44), and December (46) 1979. However, relatively few individuals were collected during these months: 1934, 1782, and 983, respectively. The greatest numbers of individuals were collected during August 1979 (2663), May (3045), and August 1980 (2344). During these months, the total numbers of species collected were low: 36, 39, and 37, respectively.

198. Across all bendways, seven species accounted for almost 70 percent of the total number of individuals. Gizzard shad and threadfin shad each comprised approximately 16 percent of the total catch. Two important sport species, the bluegill and white crappie, made up 10.1 and 8.1 percent, respectively. Three cyprinids, the blacktail shiner, sliverside shiner, and slivery minnow, together accounted for 19.4 percent of the catch. No other individual species accounted for greater than 2.8 percent of the total catch.

199. Of the major groups of species, the shads were most abundant, accounting for over 32 percent of the total number of individuals. The principal sportfishes, including largemouth bass, white and black

crappie, and bluegill and other sunfishes, were also abundant (25.5 percent), as were the minnows and shiners (24.4 percent). Catfishes (4.6 percent), suckers (3.1 percent), and freshwater drum (1.5 percent) constituted numerically minor elements of the overall ichthyofauna.

200. Due to differences in collecting methods, it was not possible to compare previously published Tombigbee River fish population studies with the present one. Boschung (1973), for example, relied primarily on seines and trammel nets and his collections included many minnow and darter species, which are best collected by seining. Others (Cotton et al. 1969, Coleman 1969, Schultz 1971) reported the results of a limited number of hoop-net collections from the Tombigbee River in the river reach immediately upstream of Hairston Bend. These results generally agree with ours, with the exception that Schultz (1971) reported smallmouth buffalo and carp as abundant species, whereas, relatively few of these fish were collected during our study.

Catch

201. The C/f for electroshocking was nearly always higher in Rattlesnake Bend and Big Creek Bendway than in Cooks and Hairston Bends (Table 6). For hoop nets the trend was more variable for Rattlesnake Bend, while for Big Creek Bendway C/f remained comparatively high. Overall, C/f for electroshocking was considerably higher than for hoop nets.

202. The C/y generally reflected the pattern of the C/f. Big Creek Bendway again showed consistently higher values than the other bendways; Rattlesnake Bend was more nearly like Cooks Bend and Hairston Bend, however.

203. Big Creek Bendway was generally highest among the bendways in terms of species catch per unit of effort. Hairston Bend showed a relatively low species catch per unit of effort at any one sampling period, while its total species number was greatest. Conversely, Rattlesnake Bend had a relatively high species catch per unit of effort at any sampling period, but the fauna of this bendway was constant over time, accounting for the overall low number of species collected.

Similarity

204. The degree of similarity between any pair of Tombigbee River bendways was related to their relative positions in a pool (Table 40). Two groups of bendways were loosely defined: a riverine group (Hairston Bend and Big Creek Bendway) and a lentic group (Cooks Bend and Rattlesnake Bend). The latter two have been pooled for several years and support fish faunas similar to southeastern U. S. reservoirs. Of the former two, Hairston Bend was pooled only late in the study, and it had no cutoff section. It thus remained essentially riverine in nature during most sampling efforts. Big Creek Bendway was unique among the four bendways studied in having both a lentic and a riverine portion. For this reason the similarity of Big Creek to the other bendways was intermediate and varied widely across the sampling efforts.

205. As a whole, the pattern of changes in similarity values between sampling periods was consistent. Similarity values for all paired combinations of bendways generally fluctuated upward or downward together. Similarities for all pairs of bendways were considerably higher during August 1979 and May and June 1980 than during the other four sampling periods.

Dissimilarity

206. The Bray-Curtis dissimilarity index (Table 41), which incorporates densities in addition to species presences, indicated relationships among bendways like those shown by the Kulczynski similarity coefficient. Rattlesnake Bend and Hairston Bend became increasingly dissimilar to the other bendways as the study proceeded. Cooks Bend also showed a pattern of dissimilarity relationships consistent with the similarity analysis. Big Creek Bendway showed nearly equal dissimilarity to all other bendways, however, and in this analysis was least like Hairston Bend.

Diversity

207. Mean diversity values decreased and became more variable from Hairston Bend to Rattlesnake Bend (Table 42). Diversities for Hairston Bend Big Creek Bendway, and Cooks Bend were similar, while the diversity at Rattlesnake Bend was considerably lower. There was no

consistent tendency for bendway diversity values to covary among sampling dates. However, at Rattlesnake Bend, Cooks Bend, and Big Creek Bendway, diversities for winter samples (January and December 1979) were considerably higher than late summer diversities (August 1979 and 1980). Hairston Bend diversities differed relatively little among sampling dates and showed no obvious seasonal pattern.

208. Shannon diversity reflects two components of biological communities: the number of species and their respective relative abundances. During the seven sampling efforts, changes in diversity at Hairston Bend and Rattlesnake Bend reflected fluctuations in the relative numbers of the most abundant species. At Big Creek Bendway, however, the number of species collected during a sampling effort was the major factor controlling diversity. Diversity at Cooks Bend reflected both components equally.

Species composition

209. The overall species composition of the four bendways differed both qualitatively and quantitatively. The number of species collected at the four bendways increased from Rattlesnake Bend to Hairston Bend. As one proceeds upstream from Rattlesnake Bend, the species unique to this bendway and those shared remain nearly unchanged. The more upstream bendways show greater numbers of unique species than found at Rattlesnake Bend. Cooks Bend had 15 species not found at Rattlesnake Bend, Big Creek Bendway had 20, and Hairston Bend had 25. Thus Rattlesnake Bend contained a base-level ichthyofauna for the combined bendways to which various numbers of species were added at the other three bendways. Rattlesnake Bend, impounded for nearly 25 years, yielded the fewest species of fish (42). Cooks Bend, also an essentially lentic habitat, yielded 52 species. This bendway has not been impounded as long as Rattlesnake Bend. That part of Big Creek Bendway located in the tailwater section of the Aliceville Lock and Dam and Hairston Bend, an unimpounded river segment, remained essentially riverine throughout the study. Those two bendways yielded the greatest numbers of fish species, 58 and 60, respectively.

210. Thirty-four species of fish were ubiquitous within the study

area. An additional 12 were collected at three of the four bendways. Nearly one-third (24) of the species were collected at only a single bendway. Hairston Bend had the greatest number of unique species (10), followed by Big Creek Bendway (6), and Cook's Bend and Rattlesnake Bend (4 each).

211. Large differences were apparent in the relative proportions of the major groups of fishes at each bendway. Sportfishes (largemouth bass, white and black crappie, and bluegill and other sunfishes) were relatively abundant at Big Creek Bendway and Rattlesnake Bend and especially abundant at Cooks Bend (Table 43). This species group was considerably less abundant at Hairston Bend. Similarly, gizzard and threadfin shad formed a large portion of the ichthyofauna at all except Hairston Bend. The minnows and shiners (Cyprinidae) were abundant in all bendways, but they reached their peak at Hairston Bend.

212. Hairston Bend and Big Creek Bendway supported much larger populations of suckers than either Cooks Bend or Rattlesnake Bend. Even more so than the minnows and shiners, suckers are inhabitants of flowing water systems. Their peak abundance was reached at Big Creek Bendway (5.8 percent) within the influence of the tailwaters of the Aliceville Lock and Dam.

213. Catfishes and freshwater drum, species of both sport and commercial importance, were considerably more abundant at Hairston Bend and Rattlesnake Bend than at Big Creek Bendway and Cooks Bend. Channel and blue catfishes were dominant at Rattlesnake Bend, while channel and flathead catfishes were dominant at Hairston Bend.

214. As mentioned earlier, seining was performed during 1980 at Cooks Bend, Big Creek Bendway, and Hairston Bend, but not at Rattlesnake Bend. However, this contributed little to the difference in the number of species between Rattlesnake Bend and the other bendways. At Cooks Bend and Big Creek Bendway, seining accounted for only a single additional species. At Hairston Bend seining accounted for five additional species not collected at Rattlesnake Bend. However, three of these species (speckled chub, dusky darter, and southern sand darter) are known or are thought to inhabit relatively swift, unsilted, clear

portions of rivers (Pflieger 1975, Smith 1979) and thus would not be expected to be part of the ichthyofauna in a lentic habitat such as Rattlesnake Bend.

Condition factors

215. Condition factors k for gizzard shad, drum, flathead catfish, channel catfish, largemouth bass, and black crappie showed no consistent differences among bendways. Bluegill tended to show slightly higher condition factors at Hairston Bend and Big Creek Bendway, and differences among bendways were significant during March 1979 and June and August 1980. White crappie exhibited a decline in condition index from spring to late summer. Although differences among the bendways were seldom significant, white crappie from Rattlesnake Bend and Cook's Bend tended to have slightly higher values.

Gonadal conditions

216. Sampling efforts were not spaced closely enough to allow definitive comparisons of species gonadal conditions among bendways. Additionally, for several species sample sizes were not adequate during all times. For three of the important sport species some comparisons could be made. White crappie were indicated as spawning primarily during May, perhaps beginning in late April, at all bendways. There was some suggestion that this species may spawn slightly later at Hairston Bend. Largemouth bass appeared to spawn during May and early June at all bendways. Bluegill were indicated as having a protracted spawning season, spawning from May through August at Big Creek Bendway, Cooks Bend, and Rattlesnake Bend. This species appeared to begin spawning slightly later at Hairston Bend, however.

Effects of channel cuts and pooling

217. Two types of physical changes are occurring in the Tombigbee River study area: channel cuts, which at least partially isolate long portions of the river, and pooling of the river by navigation locks and dams. The former is similar to a process that occurs naturally in most river systems (Leopold et al. 1964), although probably not with the frequency of the channel cuts. Pooling is primarily a man-induced change. When completed, pool elevations within the waterway will range from 28

to 35 ft above the present average level (Brahana et al. 1974). Two major effects of the pooling will be an overall reduction in current, except immediately below lock and dam complexes, and a large increase in total flow during the dry part of the year due to discharge from the canal section of the waterway.

218. The effect of the channels cut at Rattlesnake and Cooks Bends was confounded by the effects of pooling. Overall, however, the effect on the fish community due to pooling appeared to be the more significant. In these bendways, samples taken within the cuts did not differ appreciably from the samples taken from the other positions in either species complement or catch per unit of effort. In the Big Creek Bendway, the effect of the cut was to produce two distinct fish habitats: riverine in the area affected by the Aliceville Lock and Dam complex and lentic in the cutoff bend. Here the effect of pooling was of less importance in structuring the fish community. A similar change was found by Shipp and Hemphill (1974) for the Alabama River. Hairston Bend had no cut section during this study nor was it pooled for a sufficient length of time to demonstrate the faunal changes shown in the other bendways (Bhukaswan 1973).

219. Over a series of years both riverine and lentic habitats show fluctuations in their faunas. After the first few years, reservoirs tend to have relatively stable species complements, but the relative abundances of the species may vary widely and often cyclicly. Jenkins (1979) noted the over-riding importance of environmental conditions in regulating species abundance in reservoirs. Streams, on the other hand, tend to vary both in species complement and relative abundances over a series of years (Cross and Braasch 1968, Horwitz 1978, Rinne 1975, Whitaker 1976). Within the Tombigbee River study area, Rattlesnake and Cooks Bends illustrated the lentic situation, while Hairston Bend and, to a lesser extent, Big Creek Bendway, illustrated the riverine.

220. Fish communities in lentic environments are typically dominated by predaceous species, which are the principal targets of sport and commercial fishermen (Bhukaswan 1973, Noble 1980). Prey species in

impoundments in the southern U. S. are predominantly clupeids (shad) and small centrarchids (sunfishes); cyprinids (minnows and shiners) are usually of lesser importance as prey (Noble 1980).

221. The evidence from the four bendways suggests that the Tombigbee River is presently undergoing faunal changes typical of impoundments. The general pattern following impoundment is one of a decrease in both diversity and number of species. This is due to several factors, but the loss of microhabitats associated with fast currents may be of the greatest significance (Bhukaswan 1973). Although the time for the change to be completed may vary from about five years (Beckman and Elrod 1971, Patriarche and Campbell 1958) to over 11 years (Bhukaswan 1973), the specific changes are reasonably well understood. These changes include eliminated or reduced abundance of flowing water species and rapid increase in the abundance of sport fishes and, usually, shad (Carter 1968; Schoonover and Thompson 1954; Spence and Hynes 1971; Turner 1971).

222. Although sport fishes, especially bass, are often stocked into new impoundments to enhance fishery potential, most of the intial stock appears to come from species present during the preimpoundment period (Bhukaswan 1973). The abundance and biomass of sport fish populations undergo a relatively predictable change during the first years of impoundment (Turner 1971). Populations increase rapidly up through about year three and then decrease to a more stable level. This pattern is detectable in the Tombigbee River, as sport fish populations are higher in Cooks Bend, a 3-year-old impoundment, than in either Rattlesnake Bend (25 years old) or Hairston Bend, which flooded at pool level only during the early spring of 1980.

223. Shad are plankton-feeding species that, although present in large numbers in some rivers (Pflieger 1975, Rasmussen 1979), reach their peak abundance in lakes and reservoirs. Shad characteristically form the bulk of the forage base in southeastern U. S. impoundments (Houser and Netsch 1971, Netsch et al. 1971, Noble 1980), and the abundance of shad has been related to the success of some game species (Jenkins 1979, Olmsted and Kilambi 1971, Wickliff 1933).

224. Minnows and shiners typically constitute a large proportion of the fishes in rivers and streams (Bond 1979, Pflieger 1975, Smith 1979). It is not surprising, therefore, that they were by far the dominant group of fishes at Hairston Bend. Those species form a large and diverse assemblage, however, and some species do well in reservoir systems (Bond 1979). Thus, they comprise a relatively large proportion of the fauna in Big Creek Bendway, Cooks Bend, and Rattlesnake Bend, although the relative abundances of the various species are different from Hairston Bend.

225. The general pattern of similarities among the four bendways was as anticipated, and it apparently reflected both proximity and overall habitat type (i.e., lentic versus lotic). Hairston Bend and Big Creek Bendway were adjacent spatially and had considerable flowing water habitat. Cooks Bend and Rattlesnake Bend were adjacent lentic habitat type bendways. Because it had both habitat types, Big Creek Bendway showed generally intermediate similarities to all of the other three bendways.

PART VI: SUMMARY AND CONCLUSIONS

226. Changes in bottom profile and sediment composition have occurred at the four bendways since impoundment, and since completion of the channel cuts. Although changes at all bendways were evident, those at Big Creek Bendway were most pronounced.

227. During this study relatively small differences in water quality were found, either within individual bendways or among the four bendways. Big Creek Bendway was the only bendway at which consistent differences in water quality occurred between within-bendway and river stations. Even here, the magnitude of the differences was not great enough to suggest ecological stress.

228. The river is still in the process of changing from a free-flowing system to essentially a series of shallow in-stream impoundments. In conjunction with this change, further development of the immediate area (receational, industrial, etc.) can be expected. When completed the waterway will begin receiving seasonally varying amounts of water from sources outside its natural watershed. All these factors suggest that the water quality of the waterway will undergo further changes.

229. Phytoplankton populations were greater at within-bendway stations than in river stations at Big Creek Bendway and Cooks Bend and approximately equal at all transects at Hairston and Rattlesnake Bends. There were only small differences in the overall kinds and abundance of plankton at the four bendways. Plankton populations showed a seasonal pattern of low numbers in December and peak numbers in August.

230. Aquatic macrophytes were scattered and uncommon in the four bendways. Most commonly encountered was water willow, which formed small, though numerous, beds in Rattlesnake Bend.

231. All bendway macroinvertebrate collections can be characterized by a common benthic community, at least at the family level of classification. Nine families, shared by all four bendways, accounted for over 95 percent of the total collections. The four bendways cannot be distinguished statistically by average number of taxa, density of individuals, or family diversity. The four bendways increased in

qualitative similarity with increasing proximity, and increased in quantitative similarity according to relative date of bendway cut off. Seasonal collections from individual bendways, in general, showed considerable variation in both numbers and kinds of macroinvertebrates at each location.

232. With the exception of Pleurobema sp., no unusual or particularly uncommon species of Unionidae were taken from the Tombigbee River.

233. The degree of similarity in the ichtoyofauna between any pair of Tombigbee River bendways was primarily related to their relative positions in a pool. Rattlesnake Bend and Cooks Bend, located in the lower portion of their respective pools, had the most similar species compositions. Hairston Bend and Big Creek Bendway faunas were also similar, and both were located in more riverine portions of the pools. Mean species diversity values decreased and became more variable from Hairston Bend to Rattlesnake Bend. Diversities for Hairston Bend, Big Creek Bendway, and Cooks Bend were similar, while the diversity at Rattlesnake Bend was considerably lower.

234. Large differences were apparent in the relative proportions of the major groups of fishes at each bendway. Sport fishes (largemouth bass, white and black crappie, and bluegill and other sunfishes) were relatively abundant at Big Creek Bendway, Rattlesnake Bend, and Cooks Bend. This species group was considerably less abundant at Hairston Bend. Similarly, gizzard and threadfin shad formed a large portion of the ichthyofauna at all except Hairston Bend. The minnows and shiners (Cyprinidae) were abundant in all bendways, but were most abundant at Hairston Bend. Hairston Bend and Big Creek Bendway supported much larger populations of suckers than either Cooks Bend or Rattlesnake Bend.

235. Condition factors and gonadal indices for most species of fish showed no consistent differences among bendways.

236. Modification of the Tombigbee River has resulted in a net loss of lotic habitat. Factors involved with construction of the waterway include channel modification by ditching and dredging, pooling behind a series of locks and dams, and cutting off of bendways.

Although the effects of these factors are often confounded, impoundment behind the lock and dam complexes primarily affects the more downstream areas of the pools, while bendways in the upper, more riverine, portions of the pools may be affected more seriously by the channel cuts.

237. The evidence from the four bendways suggests that overall the Tombigbee River is undergoing faunal changes typical of new impoundments, i.e., a decrease in both diversity and number of species. The loss of microhabitats associated with fast currents may be of the greatest significance.

238. The cutoff bendways, analagous in many respects to oxbow lakes, will provide habitat that would not be found along the main navigation channel. Due to construction activities, main navigation channel segments will contain few structural features considered important as fish and wildlife habitat, e.g. backwaters, sinuous shorelines, and submerged brush and trees. Cutoff bendways will remain relatively unaltered in these respects, and they can be expected to provide a significant fish and wildlife and recreational resource.

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Table 1

Mean Values for Water-Quality Parameters Measured at the Surface (S) and Below the Surface (SS) at Rattlesnake Bend

Parameter	Transect Location*	Dec 79		May 80		Jun 80		Jul 80 (1)		Jul 80 (2)		Aug 80 (1)		Aug 80 (2)		Sep 80	
		S	SS	S	SS	S	SS	S	SS	S	SS	S	SS	S	SS	S	SS
Current speed, m/sec	AB	0.08	0.08	0.33	0.47	0.00	0.00	0.20	0.20	0.10	0.10	0.03	0.03	0.00	0.00	0.00	0.00
	B	0.08	0.08	0.11	0.22	0.00	0.00	0.20	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	BB	0.14	0.14	0.30	0.43	0.00	0.00	0.14	0.14	0.07	0.07	0.02	0.02	0.00	0.00	0.00	0.00
Temperature, °C	AB	8.3	8.2	18.2	18.2	26.7	27.4	29.8	29.7	31.6	30.7	31.0	30.8	31.4	31.1	30.6	30.4
	B	8.0	8.0	18.8	18.3	26.7	27.2	30.6	29.5	32.6	30.8	31.4	30.7	32.4	31.6	31.2	30.6
	BB	8.3	8.1	18.4	18.3	27.4	27.4	28.9	29.1	32.8	31.0	31.7	30.9	32.8	32.1	30.9	30.6
Dissolved Oxygen, mg/ℓ	AB	10.1	9.8	7.7	7.5	8.1	7.6	8.6	7.6	9.6	6.7	6.9	5.6	5.0	3.7	6.1	4.1
	B	9.7	9.9	7.5	7.5	7.4	6.7	9.2	6.9	9.0	5.8	8.4	5.6	5.9	4.5	6.8	5.9
	BB	9.6	9.5	7.5	7.2	7.1	7.1	7.3	6.1	9.1	5.9	8.3	5.3	6.3	3.7	6.1	4.6
pH	AB	7.1	7.2	7.1	7.0	7.3	7.3	7.5	7.4	8.4	8.2	7.6	7.5	7.9	7.7	7.9	7.7
	B	7.0	7.0	7.1	7.0	7.3	7.2	8.2	7.8	8.5	7.7	8.4	7.7	8.0	7.7	8.1	8.1
	BB	7.0	7.0	7.3	7.2	7.3	7.3	7.5	7.4	8.2	8.0	8.5	7.6	8.2	7.8	7.8	7.5
Conductivity, µmhos/cm	AB	109	109	105	105	112	112	143	143	170	173	167	166	170	172	188	190
	B	108	108	106	105	112	112	148	150	178	179	168	171	172	176	179	181
	BB	111	107	108	106	110	110	148	152	177	180	173	172	173	174	182	183
Secchi Visibility, m	B	—	0.34	—	0.29	—	0.42	—	0.63	—	0.76	—	0.87	—	1.06	—	0.87
	C	—	0.33	—	0.29	—	0.47	—	0.60	—	0.66	—	0.92	—	1.09	—	0.90
Turbidity, NTU	B	28.2	28.2	33.8	33.8	14.7	14.7	18.3	18.3	9.0	9.0	5.7	5.7	4.4	5.6	—	—
	C	29.0	28.4	35.0	34.1	13.0	14.2	19.0	18.4	11.5	9.6	6.0	5.8	6.8	6.0	—	—
Carbon dioxide, mg/ℓ	B	4.3	4.3	5.3	5.3	3.5	3.5	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	—	—
	C	5.5	5.5	6.0	6.0	3.0	3.0	5.0	5.0	0.0	0.0	2.5	2.5	0.0	0.0	—	—
Alkalinity, mg/ℓ	B	30.0	—	38.0	—	31.0	—	8.8	—	49.8	—	31.2	—	60.2	—	—	—
	C	31.5	—	37.0	—	29.5	—	11.0	—	50.0	—	9.0	—	56.0	—	—	—
Ammonia Nitrogen, mg/ℓ	B	0.10	0.10	0.27	0.27	0.06	0.06	0.05	0.05	0.47	0.56	0.05	0.05	0.31	0.45	—	—
	C	0.20	0.20	0.05	0.05	0.10	0.10	0.01	0.01	0.93	0.70	0.05	0.05	0.50	0.35	—	—
Total Phosphorus, mg/ℓ	B	0.40	0.40	0.32	0.32	0.13	0.13	0.04	0.04	0.42	0.40	0.97	0.97	0.09	0.13	—	—
	C	0.43	0.43	0.35	0.35	0.19	0.19	0.05	0.05	0.15	0.22	0.81	0.81	0.05	0.06	—	—
Orthophosphorus, mg/ℓ	B	0.17	0.17	0.18	0.18	0.00	0.00	0.05	0.05	0.03	0.03	0.19	0.19	0.03	0.05	—	—
	C	0.15	0.15	0.31	0.31	0.00	0.00	0.07	0.07	0.01	0.01	0.06	0.06	0.03	0.03	—	—

* Entries in this column denote transect locations:
- AB - above bendway
- B - within bendway
- BB - below bendway
- C - combined above and below bendway

Table 2

Mean Pigment Concentrations for Each Bendway by Date

Bendway/Dates	Total Chlorophyll	Total Phaeophytin	Chlorophyll a	Chlorophyll b	Chlorophyll c	Carotenoid 1	Carotenoid 2	P-Chlorophyll a	Phaeophytin
Rattlesnake Bend									
Dec 79	0.290	0.124	0.134	0.025	0.131	0.051	0.128	0.147	-0.023
May 80	0.309	0.162	0.148	0.108	0.054	0.081	0.202	0.136	0.026
Jun 80	0.475	0.511	0.466	0.034	-0.025	0.076	0.439	0.379	0.132
Jul 80(1)	0.648	0.913	0.748	0.187	-0.287	0.283	0.707	0.495	0.418
Jul 80(2)	-4.371	-2.602	0.819	0.015	-0.139	0.298	0.744	0.745	0.092
Aug 80(1)	0.897	1.000	0.958	0.239	-0.299	0.371	0.928	0.877	0.123
Aug 80(2)	0.806	0.680	0.554	0.544	-0.292	0.338	0.845	0.427	0.253
Sep 80	0.366	0.340	0.301	0.215	-0.150	0.085	0.212	0.259	0.081
Cooks Bend									
Dec 79	0.243	0.174	0.195	0.045	0.003	0.040	0.100	0.221	-0.048
May 80	0.290	0.164	0.154	0.113	0.024	0.074	0.186	0.149	0.014
Jun 80	0.513	0.721	0.719	-0.072	-0.134	0.193	0.481	0.660	0.061
Jul 80(1)	-0.958	-0.228	0.915	0.208	-0.391	0.316	0.790	0.878	0.046
Jul 80(2)	0.535	0.793	0.730	0.038	-0.233	0.221	0.553	0.600	0.193
Aug 80(1)	0.805	0.911	0.901	0.068	-0.164	0.383	0.958	0.843	0.067
Aug 80(2)	0.522	0.603	0.499	0.460	-0.407	0.259	0.647	0.389	0.213
Sep 80	-1.189	-0.713	0.368	0.215	-0.096	0.127	0.317	0.322	0.088

(Continued)

Table 2 (Concluded)

Bendway/Dates	Total Chlorophyll	Total Phaeophytin	Chlorophyll a	Chlorophyll b	Chlorophyll c	Carotenoid 1	Carotenoid 2	P-Chlorophyll a	Phaeophytin
Big Creek Bendway									
Dec 79	-1.407	-0.964	0.156	0.019	0.083	0.042	0.105	0.169	-0.024
May 80	0.373	0.171	0.175	0.131	0.068	0.091	0.227	0.192	-0.021
Jun 80	0.691	0.849	0.783	-0.004	-0.089	0.238	0.594	0.641	0.209
Jul 80(1)	0.467	0.760	0.746	0.104	-0.382	0.149	0.371	0.693	0.067
Jul 80(2)	1.020	1.149	1.080	0.190	-0.250	0.305	0.762	0.946	0.204
Aug 80(1)	1.026	1.019	0.898	0.398	-0.270	0.237	0.667	0.734	0.284
Aug 80(2)	0.978	1.088	1.044	0.446	-0.512	0.289	0.723	0.986	0.102
Sep 80	-2.483	-1.502	0.599	0.774	-0.453	0.187	0.468	0.417	0.369
Hairston Bend									
Dec 79	0.292	0.351	0.125	0.034	0.113	0.095	0.237	-0.198	0.549
May 80	0.338	0.104	0.181	0.113	0.043	0.081	0.202	0.299	-0.195
Jun 80	0.871	1.207	1.113	0.024	-0.265	0.257	0.643	0.913	0.294
Jul 80(1)	0.538	0.835	0.720	0.031	-0.151	0.125	0.312	0.506	0.329
Jul 80(2)	0.801	0.723	0.586	0.145	0.071	0.134	0.335	0.382	0.341
Aug 80(1)	0.702	1.063	0.918	0.189	-0.405	0.260	0.650	0.681	0.382
Aug 80(2)	1.360	1.258	1.132	0.792	-0.564	0.420	1.050	1.008	0.250
Sep 80	0.759	0.594	0.514	0.090	0.155	0.096	0.241	0.387	0.207

Table 3

Total Catch of Macroinvertebrates Collected in Rattlesnake Bend

Family	Collection Date - Number of Individuals							Total Collection
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Jul 80	
Worms:								
Tubificidae	143	82	185	83	175	23	80	771
Naididae	0	8	1	0	1	0	5	15
Mollusks:								
Pelecypods	0	0	0	0	0	1	52	53
Sphaeriidae	19	3	13	26	50	93	24	228
Pleuroceridac	1	1	0	1	0	2	1	6
Unionidae	0	1	9	0	0	0	0	10
Gastropoda	0	0	0	0	17	27	19	63
Insecta:								
Ephemeridae	182	119	106	262	271	167	149	1256
Caenidae	0	4	0	0	2	3	0	9
Gomphidae	2	0	0	0	4	2	0	8
Polycentropodidae	1	0	0	8	10	10	4	33
Leptoceridae	0	3	2	3	0	6	2	16
Hydropsychidae	0	1	0	1	0	8	0	10
Sialidae	1	0	2	0	5	14	12	34
Elmidae	5	1	5	1	0	0	0	12
Chaoboridae	463	26	76	39	20	31	639	1294
Ceratopogonidae	1	27	34	38	32	15	78	225
Chironomidae	620	97	137	122	96	159	331	1562
Summary Statistics:								
Individuals:								
N	1438	373	570	584	683	561	1396	5605
Total N	1446	390	577	586	688	562	1402	5651
%	99.5	95.6	98.8	99.7	99.3	99.8	99.6	99.2
Families:								
N	11	13	11	11	12	15	13	18
Total N	18	21	15	12	16	16	15	38
%	61.1	61.9	73.3	91.7	75.0	93.8	86.7	47.4
Diversity:								
H'	1.97	2.72	2.54	2.30	2.48	2.76	2.35	2.70
$\bar{x}$ H'								2.45

Table 4

Indices of Similarity for Rattlesnake Bend

Seasonal Macroinvertebrate Collections

Procedure	Sampling Date	Comparison Date - Index: Mar 79	Aug 79	Dec 79	May 80	Jun 80	Jul 80
Jaccard Coefficient	Jan 79	30.0	37.5	42.9	36.0	47.8	37.5
	Mar 79		44.0	43.5	27.6	37.0	38.5
	Aug 79			42.1	34.8	34.8	42.9
	Dec 79				40.0	55.6	50.0
	May 80					52.4	55.0
	Jun 80						63.2
Morisita Index	Jan 79	0.72	0.76	0.62	0.52	0.71	0.90
	Mar 79		0.93	0.95	0.94	0.86	0.56
	Aug 79			0.78	0.85	0.71	0.64
	Dec 79				0.96	0.88	0.50
	May 80					0.81	0.40
	Jun 80						0.54

Table 5

Species and Relative Abundance of Fish Captured at Rattlesnake Bend

by Sampling Date and Gear Type*

Species	Jan 1979 %				Mar 1979 %				Aug 1979 %				Dec 1979 %			May 1980 %			Jun 1980 %			Aug 1980 %			Sample Periods Combined, %
	ES	HN	MT	TL	ES	HN	MT	TL	ES	HN	MT	TL	ES	HN	TL	ES	HN	TL	ES	HN	TL	ES	HN	TL	
Spotted gar	—	—	—	—	—	—	—	—	0.3	3.7	—	0.3	—	—	—	0.6	—	0.5	—	—	—	—	—	—	0.2
Longnose gar	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.8	—	0.6	—	—	—	—	—	—	0.1
Bowfin	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.7	0.1	—	—	—	—	—	—	0.02
American eel	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.2	—	0.1	—	—	—	—	—	—	0.02
Skipjack herring	—	—	—	—	0.1	—	—	0.1	0.2	—	—	0.2	2.7	—	1.0	0.3	—	0.3	0.5	—	0.3	—	—	—	0.2
Gizzard shad	2.4	—	—	1.9	12.6	—	—	11.6	8.7	3.7	—	8.2	8.1	—	3.1	4.1	10.9	5.3	23.7	—	15.4	1.0	—	0.9	6.4
Threadfin shad	24.3	—	—	18.5	3.4	—	—	3.2	84.4	—	—	78.6	10.8	—	4.1	71.7	—	59.0	10.6	—	6.9	0.4	—	0.4	33.4
Silvery minnow	0.7	—	—	0.6	0.1	—	—	0.1	—	—	—	—	5.4	—	2.1	—	—	—	—	—	—	0.1	—	0.1	0.2
Silver chub	—	1.5	—	0.1	0.5	—	—	0.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Golden shiner	0.2	—	—	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Emerald shiner	12.0	—	3.0	9.5	—	—	—	—	—	—	—	—	10.8	—	4.1	—	—	—	—	—	—	—	—	—	1.5
River shiner	—	—	—	—	—	—	12.9	0.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Silverside shiner	—	—	—	—	—	—	—	—	—	—	—	—	18.9	—	7.2	1.7	—	1.4	4.0	—	2.6	72.2	—	66.7	12.6
Ironcolor shiner	—	—	—	—	—	—	—	—	—	—	3.7	0.2	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Fluvial shiner	0.6	—	3.0	0.9	0.7	—	—	0.6	—	—	—	—	—	—	—	—	—	—	—	—	—	5.8	—	5.3	1.2
Pugnose minnow	—	—	—	—	0.1	—	—	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Silverband shiner	6.0	—	82.8	16.2	0.3	—	—	0.3	—	—	70.4	3.2	—	—	—	—	—	—	—	—	—	—	—	—	3.3
Silverstripe shiner	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.3	—	0.3	—	—	—	4.6	—	4.3	0.8
Weed shiner	0.2	—	—	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Blacktail shiner	—	—	—	—	—	—	3.2	0.1	0.3	—	—	0.3	2.7	—	1.0	0.6	—	0.5	2.0	—	1.3	9.3	—	8.5	1.8
Mimic shiner	—	—	—	—	—	—	—	—	0.1	—	—	0.1	2.7	—	1.0	—	—	—	—	—	—	—	—	—	0.04
Bullhead minnow	—	—	4.0	0.6	0.7	—	71.0	3.4	0.1	—	11.1	0.6	2.7	—	1.0	0.3	—	0.3	1.0	—	0.7	—	—	—	0.9
Quillback	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.9	—	0.8	3.5	—	2.3	—	—	—	0.3
Highfin carpsucker	—	—	—	—	0.2	—	—	0.2	0.2	—	—	0.2	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Smallmouth buffalo	—	—	—	—	2.9	—	—	2.7	0.5	—	—	0.5	—	—	—	—	—	—	—	0.9	0.3	—	—	—	0.6
Spotted sucker	—	—	—	—	—	3.4	—	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Blacktail redhorse	0.2	1.5	—	0.3	0.1	—	—	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Blue catfish	—	7.4	—	0.7	11.6	37.9	—	12.2	0.5	—	—	0.4	—	5.0	3.1	—	—	—	—	—	—	—	—	—	2.3
Channel catfish	—	1.5	—	0.1	17.3	20.7	3.2	16.8	0.5	—	—	0.5	—	1.7	1.0	0.2	0.7	0.3	—	—	—	—	—	—	3.1
Flathead catfish	—	—	—	—	0.3	10.3	—	0.6	0.8	3.7	—	0.9	—	8.3	5.2	—	6.6	1.2	0.5	4.7	2.0	—	3.1	0.2	0.8
Atlantic needlefish	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.0	—	1.7	3.0	—	2.0	0.9	—	0.8	0.6
Blackspotted top-minnow	0.2	—	—	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Warmouth	0.6	—	—	0.4	0.1	—	—	0.1	—	—	—	—	—	—	—	—	2.2	0.4	0.5	—	0.3	—	—	—	0.2
Bluegill	15.1	2.9	6.1	12.7	14.5	3.4	6.5	13.8	1.7	40.7	13.7	3.2	10.8	43.3	30.9	4.6	37.2	10.3	28.8	60.7	40.0	1.9	61.5	6.5	11.2
Longear sunfish	1.9	—	—	1.4	1.1	—	—	1.0	0.1	—	—	0.1	—	—	—	2.2	2.2	0.5	1.5	2.8	2.0	0.3	—	0.2	0.7
Redear sunfish	1.9	—	—	1.4	0.7	—	—	0.6	—	—	—	—	—	5.0	3.1	—	1.5	0.3	0.5	15.0	5.6	0.1	13.8	1.2	1.0
Spotted sunfish	—	—	—	—	—	—	3.2	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Largemouth bass	5.2	1.5	—	4.1	3.4	—	—	3.2	1.1	—	—	1.0	2.7	—	1.0	9.1	—	7.5	18.7	—	12.1	0.5	—	0.5	3.5
White crappie	26.7	76.5	—	27.8	19.5	3.4	—	18.1	0.2	18.5	—	0.6	5.4	31.7	21.6	1.7	14.6	4.0	—	7.5	2.6	—	12.3	0.9	8.8
Black crappie	—	1.5	—	0.1	0.5	—	—	0.5	—	25.9	—	0.6	2.7	1.7	2.1	0.2	13.9	2.6	—	5.6	2.0	—	3.1	0.2	0.9
Freshwater drum	—	5.9	—	0.6	9.0	20.7	—	9.1	0.3	3.7	—	0.3	—	3.3	2.1	0.2	9.5	1.8	0.5	2.8	1.3	—	4.6	0.4	2.2
Striped mullet	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.2	—	0.1	—	—	—	—	—	—	0.02
Unindentified to species	1.9	—	1.0	1.6	—	—	—	—	—	—	1.9	0.1	13.5	—	5.2	0.2	—	0.1	0.5	—	0.3	2.8	1.5	2.7	0.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* Gear types are identified in column headings as follows:
- ES - electroshocker
- HN - hoop net
- MT - minnow trap
- TL - total for all gear types

Table 6

Catch Per Unit of Effort by Sampling Date and Bendway for Positions at Each Site

Sampling Date Bendway Position*	Mean Number of Fish Per Station (C/f)		Mean Weight of Fish per Station (C/y)		Mean Number of Species Per Station	
	Electro-shocker	Hoop Net	Electro-shocker	Hoop Net	Electro-shocker	Hoop Net
January 1979						
Rattlesnake Bend						
AB	21.5	0.1	2.8	0.1	4.5	0.1
BB	13.7	0.8	0.5	0.1	4.3	0.4
B	42.6	2.0	2.9	0.3	5.3	0.4
C	12.5	2.0	0.9	0.2	4.0	0.5
Cooks Bend						
AB	7.8	0.5	0.3	0.1	3.8	0.5
BB	2.2	0.0	0.1	0.0	1.4	0.0
B	4.3	1.0	0.3	0.2	2.9	0.8
Big Creek Bendway						
AB	31.5	7.0	4.4	3.3	10.0	3.7
BB	11.0	2.8	1.6	0.3	5.0	1.3
B	31.9	3.8	5.1	1.0	9.3	2.0
C	9.5	0.3	0.8	0.1	3.5	0.3
Hairston Bend						
AB	40.0	1.8	4.3	0.8	11.0	1.3
BB	6.0	2.8	3.9	1.1	3.2	1.8
B	14.3	0.1	2.2	0.1	3.3	0.1
March 1979						
Rattlesnake Bend						
AB	37.0	2.3	2.5	0.8	10.5	1.8
BB	37.5	1.0	2.1	0.4	7.0	0.8
B	36.8	0.7	3.5	0.3	9.6	0.6
C	38.0	2.0	2.5	0.2	6.0	1.0
Cooks Bend						
AB	27.5	1.7	0.1	0.1	8.0	1.0
BB	16.5	0.0	0.1	0.0	5.3	0.0
B	13.6	1.2	0.1	0.2	5.8	0.8
Big Creek Bendway						
AB	53.0	1.3	5.4	0.1	11.0	0.5
BB	11.0	1.8	1.6	0.7	4.5	1.3
B	17.5	1.8	3.7	1.1	7.5	1.5
C	45.0	8.0	6.8	1.1	15.0	1.8

(Continued)

* AB = above bendway, BB = below bendway, B = within bend, C = channel cut.

Table 6 (Continued)

Sampling Date Bendway Position	Mean Number of Fish Per Station (C/f)		Mean Weight of Fish per Station (C/y)		Mean Number of Species Per Station	
	Electro-shocker	Hoop Net	Electro-shocker	Hoop Net	Electro-shocker	Hoop Net
Hairston Bend						
AB	10.5	2.3	3.9	1.7	4.0	1.5
BB	2.5	4.5	1.1	1.7	1.0	2.0
B	5.5	1.0	1.5	0.6	2.4	0.6
August 1979						
Rattlesnake Bend						
AB	29.0	0.0	1.6	0.0	6.5	0.0
BB	61.5	0.0	1.7	0.0	5.0	0.0
B	91.8	1.4	1.3	0.5	5.2	0.8
C	163.0	2.5	3.0	0.2	3.5	1.0
Cooks Bend						
AB	37.0	1.0	2.0	0.1	7.5	0.8
BB	11.5	0.5	2.7	0.1	5.0	0.5
B	32.7	0.3	3.8	0.1	3.8	0.3
Big Creek Bendway						
AB	28.5	5.0	5.4	0.9	7.0	1.0
BB	17.5	3.5	1.0	0.8	4.5	2.0
B	67.3	2.7	5.7	1.3	8.2	1.6
C	10.0	6.5	5.2	1.1	3.0	3.0
Hairston Bend						
AB	9.7	1.3	3.3	0.3	5.0	0.7
BB	25.0	2.0	2.8	3.5	5.5	0.8
B	8.9	3.0	2.6	2.2	4.3	1.4
December 1979						
Rattlesnake Bend						
AB	0.8	0.0	0.1	0.0	0.8	0.0
BB	1.0	1.8	0.1	0.4	0.8	1.0
B	2.4	3.8	0.1	0.3	1.4	1.3
C	0.3	1.8	0.0	0.9	0.3	1.5
Cooks Bend						
AB	1.3	2.0	[illegible]	0.4	1.0	1.5
BB	7.8	2.8	0.1	0.2	2.5	1.8
B	3.4	1.7	0.1	0.1	2.1	0.9

(Continued)

Table 6 (Continued)

Sampling Date Bendway Position	Mean Number of Fish Per Station (C/f) Electro-shocker	Hoop Net	Mean Weight of Fish per Station (C/y) Electro-shocker	Hoop Net	Mean Number of Species Per Station Electro-shocker	Hoop Net
Big Creek Bendway						
AB	3.3	2.8	0.5	0.8	1.8	1.8
BB	1.3	1.3	0.0	0.2	1.3	1.3
B	13.9	4.5	2.2	0.3	3.7	1.7
C	1.0	1.3	0.1	0.1	0.3	1.0
Hairston Bend						
AB	0.8	0.8	0.1	0.6	0.8	0.8
BB	4.3	2.3	0.3	1.9	1.8	1.8
B	1.0	1.6	0.3	0.6	0.6	0.8
May 1980						
Rattlesnake Bend						
AB	53.0	5.3	1.5	1.9	4.3	3.0
BB	16.3	7.0	1.2	1.6	5.8	2.5
B	24.8	3.7	1.8	0.3	5.5	2.1
C	15.5	11.0	1.1	1.8	4.5	3.8
Cooks Bend						
AB	10.5	17.0	0.6	1.3	4.0	2.5
BB	8.0	12.0	0.3	0.8	3.3	2.5
B	8.5	11.9	0.5	0.9	3.5	1.5
C	3.5	18.0	0.2	4.1	1.5	4.3
Big Creek Bendway						
AB	34.3	5.8	5.4	0.9	9.8	1.0
BB	32.0	3.5	5.4	1.0	7.8	2.0
B	62.1	2.6	6.0	0.2	8.3	1.1
C	35.5	7.8	5.2	2.3	9.3	3.3
Hairston Bend						
AB	8.8	7.3	1.3	1.1	4.0	3.5
BB	3.8	0.5	0.3	0.2	2.3	0.5
B	2.9	2.6	0.6	1.1	2.1	1.8
June 1980						
Rattlesnake Bend						
AB	5.0	1.3	0.9	0.1	3.3	0.8
BB	8.3	6.8	0.3	1.3	3.3	2.5
B	9.6	5.2	0.6	0.4	4.1	1.4
C	7.5	3.3	0.6	0.4	4.3	2.0

(Continued)

Table 6 (Concluded)

Sampling Date Bendway Position	Mean Number of Fish Per Station (C/f)		Mean Weight of Fish per Station (C/y)		Mean Number of Species Per Station	
	Electroshocker	Hoop Net	Electroshocker	Hoop Net	Electroshocker	Hoop Net
Cooks Bend						
AB	6.0	2.0	1.1	0.5	4.0	1.5
BB	3.3	4.5	0.2	0.3	1.8	1.8
B	4.3	3.8	0.2	0.4	2.8	1.6
C	4.8	0.5	0.8	0.1	3.0	0.5
Big Creek Bendway						
AB	10.3	18.8	0.6	2.6	4.5	4.5
BB	7.8	3.0	1.1	0.6	5.3	1.3
B	22.1	0.6	3.8	0.1	5.9	0.5
C	5.8	12.0	0.1	1.8	3.0	3.5
Hairston Bend						
AB	6.3	0.3	0.4	0.1	1.8	0.3
BB	12.0	7.0	0.9	1.1	4.5	2.8
B	20.5	5.9	0.4	1.8	3.5	1.6
August 1980						
Rattlesnake Bend						
AA	3.5	3.8	0.1	0.5	2.5	2.5
BB	31.0	6.0	0.1	0.5	4.3	1.0
B	47.9	1.6	0.1	0.2	3.9	0.8
C	16.3	1.8	0.1	0.1	2.8	1.0
Cooks Bend						
AB	1.5	13.8	0.1	1.6	1.3	3.5
BB	4.8	11.3	0.1	0.7	1.8	2.3
B	5.8	9.2	0.1	0.6	1.0	1.8
C	0.3	2.8	0.0	0.2	0.3	0.8
Big Creek Bendway						
AB	2.5	1.5	0.1	0.2	2.0	1.0
BB	1.3	5.8	0.1	1.3	1.3	2.5
B	22.5	1.5	0.2	0.1	3.1	0.5
C	1.0	23.8	0.0	3.4	0.8	2.5
Hairston Bend						
AB	2.3	0.5	0.1	0.1	1.8	0.3
BB	2.3	8.5	0.1	0.7	2.3	1.5
B	2.8	6.0	0.1	0.8	1.5	1.2

Table 7

Species and Number of Individuals of Fish Captured at the Above-Bendway Stations at Rattlesnake Bend

Species	Number by Sampling Date* Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
Spotted gar	--	--	2	--	1	--	--	3
Skipjack herring	--	--	1	1	2	--	--	4
Gizzard shad	2	1	14	--	2(1)	6	1	27
Threadfin shad	--	2	30	1	189	--	1	223
Silver chub	--	2	--	--	--	--	--	2
Emerald shiner	18	--	--	--	--	--	--	18
Fluvial shiner	--	3	--	--	--	--	--	3
Silverband shiner	--	1	--	--	--	--	--	1
Silverstripe shiner	--	--	--	--	1	--	1	1
Blacktail shiner	--	--	2	--	--	1	4	7
Mimic shiner	--	--	1	--	--	--	--	1
Bullhead minnow	--	2	--	--	--	--	--	2
Quillback	--	--	--	--	--	1	--	1
Smallmouth buffalo	--	1	1	--	--	--	--	2
Spotted sucker	--	--(1)	--	--	--	--	--	1
Blue catfish	--	21(2)	1	--	--	--	--	24
Channel catfish	--	18(1)	--	--	--(1)	--	--	20
Flathead catfish	--	1(1)	--	--	--(3)	--	--(1)	6
Atlantic needlefish	--	--	--	--	5	3	1	9
Warmouth	--	--	--	--	--(1)	--	--	1

(Continued)

* Catch is indicated separately for electros'ocker and hoop nets, with hoop-net catch in parentheses.

Table 7 (Concluded)

Species	Number by Sampling Date							Total
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	
Bluegill	5	6(1)	4	1	2(6)	3(2)	4(5)	39
Longear sunfish	--	1	--	--	--	1	--	2
Redear sunfish	--	--	--	--	--	--(2)	--(1)	3
Largemouth bass	4	3	2	--	9	5	1	24
White crappie	14	8	--	--	1(5)	--(1)	--(6)	35
Black crappie	--	1	--	--	--(1)	--	--(1)	3
Freshwater drum	--(1)	3(3)	--	--	--(3)	--	--	10
Total number of individuals	43(1)	74(9)	58	3	212(21)	20(5)	13(13)	472
Number of species	6	17	10	3	14	9	11	27

Table 8

Species and Number of Individuals of Fish Captured at the Within-Cut Stations at Rattlesnake Bend

Species	Number by Sampling Date*							Total
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	
Bowfin	--	--	--	--	--(1)	--	--	1
Gizzard shad	--	1	8	--	4	11	--	24
Threadfin shad	--	1	308	--	33	7	--	349
Silvery minnow	1	--	--	--	--	--	1	2
Silver chub	--(1)	--	--	--	--	--	--	1
Emerald shiner	2	--	--	--	--	--	--	2
Silverside shiner	--	--	--	--	2	--	18	20
Fluvial shiner	--	--	--	--	--	--	1	1
Silverstripe shiner	--	--	--	--	1	--	16	17
Blacktail shiner	--	--	--	--	1	1	25	27
Quillback	--	--	--	--	2	1	--	3
Smallmouth Buffalo	--	2	--	--	--	--	--	2
Blacktail redhorse	--(1)	--	--	--	--	--	--	1
Blue catfish	--	17(5)	2	--(2)	--	--	--	26
Channel catfish	--	28(1)	--	--	1	--	--	30
Flathead catfish	--	--(1)	6	--(3)	--(2)	--(1)	--	13
Atlantic needlefish	--	--	--	--	4	1	1	6
Blackspotted topminnow	1	--	--	--	--	--	--	1
Warmouth	--	--	--	--	--(1)	--	--	1
Bluegill	7	8	--(7)	--(1)	1(21)	3(5)	--(5)	58

(Continued)

* Catch is indicated separately for electroshocker and hoop nets, with hoop-net catch in parentheses.

Table 8 (Concluded)

Species	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
	Number by Sampling Date							
Longear sunfish	--	--	--	--	--(2)	1(2)		5
Redear sunfish	1	--	--	--	--(2)	--(3)	--	6
Largemouth bass	1	--	2	--	12	5	--	20
White crappie	12(13)	10	--	--(1)	--(5)	--(2)	--	43
Black crappie	--(1)	--	--(2)	--	--(8)	--	--	11
Freshwater drum	--	9(1)	--(1)	--	--(2)	--	--(2)	15
Striped mullet	--	--	--	--	1	--	--	1
Total number of individuals	25 (16)	76 (8)	326 (10)	(7)	62 (44)	30 (13)	62 (7)	686
Number of species	10	9	8	4	19	11	8	27

Table 9

Species and Number of Individuals of Fish Captured at the Below-Bendway Stations at Rattlesnake Bend

Species	Number by Sampling Date*							
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
Longnose gar	--	--	--	--	1	--	--	1
Skipjack herring	--	1	--	--	--	--	--	1
Gizzard shad	2	7	21	--	7(7)	12	1	57
Threadfin shad	1	8	95	3	35	4	--	146
Silvery minnow	1	--	--	1	--	--	--	2
Golden shiner	1	--	--	--	--	--	--	1
Emerald shiner	13	--	--	--	--	--	--	13
Silverside shiner	--	--	--	--	2	2	64	68
Fluvial shiner	--	--	--	--	--	--	14	14
Silverband shiner	6	--	--	--	--	--	--	6
Silverstripe shiner	--	--	--	--	--	--	9	9
Blacktail shiner	--	--	1	--	--	--	29	30
Bullhead minnow	--	--	--	--	2	1	--	3
Quillback	--	--	--	--	1	--	--	1
Smallmouth buffalo	--	2	--	--	--	--	--	2
Blue catfish	--(2)	22	--	--	--	--	--	24
Channel catfish	--(1)	21(2)	--	--(1)	--	--	--	25
Flathead catfish	--	--(1)	1	--(1)	--(3)	--(3)	--	9
Atlantic needlefish	--	--	--	--	2	--	1	3
Bluegill	--	3	--	--	6(5)	8(15)	2(21)	60

(Continued)

* Catch is indicated separately for electroshocker and hoop nets, with hoop-net catch in parentheses.

Table 9 (Concluded)

Species	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
	Number by Sampling Date							
Longear sunfish	--	--	1	--	--	--(1)	--	2
Redear sunfish	2	--	--	--	--	--(5)	--(2)	9
Largemouth bass	--	1	2	--	7	6	2	18
White crappie	8	--	--	--(4)	1(8)	--(2)	--	23
Black crappie	--	--	--	--(1)	--(3)	--(1)	--	5
Freshwater drum	--(3)	10(1)	--	--	--(2)	--	--(1)	17
Total number of individuals	34(6)	75(4)	121	4(7)	64(28)	33(27)	122(24)	453
Number of species	11	10	6	6	13	11	10	26

Table 10

Species and Number of Individuals of Fish Captured at the Within-Bendway Stations at Rattlesnake Bend

Species	Number by Sampling Date*							Total
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	
Spotted gar	--	--	--(1)	--	3	--	--	4
Longnose gar	--	--	--	--	4	--	--	4
American eel	--	--	--	--	1	--	--	1
Skipjack herring	--	--	1	--	--	1	--	2
Gizzard shad	9	18	44(1)	3	13(7)	18	6	119
Threadfin shad	129	5	469	--	200	10	2	815
Silvery minnow	2	1	--	1	--	--	--	4
Silver chub	--	2	--	--	--	--	--	2
Emerald shiner	31	--	--	4	--	--	--	35
Silverside shiner	--	--	--	7	7	6	480	500
Fluvial shiner	3	2	--	--	--	--	28	33
Pugnose minnow	--	1	--	--	--	--	--	1
Silverband shiner	26	1	--	--	--	--	--	27
Silverstripe shiner	--	--	--	--	--	--	10	10
Weed shiner	1	--	--	--	--	--	--	1
Blacktail shiner	--	--	--	1	3	2	14	20
Mimic shiner	--	--	--	1	--	--	--	1
Bullhead minnow	--	3	1	1	--	1	--	6
Quillback	--	--	--	--	3	5	--	8

(Continued)

* Catch is indicated separately for electroshocker and hoop nets, with hoop-net catch in parentheses.

Table 10 (Concluded)

Species	Number by Sampling Date							Total
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	
Highfin carpsucker	--	2	1	--	--	--	--	3
Smallmouth buffalo	--	15	2	--	--	--(1)	--	18
Blacktail redhorse	1	--	--	--	--	--	--	1
Blue catfish	--(3)	25(4)	2	--(1)	--	--	--	35
Channel catfish	--	57(2)	5	--	--	--	--	64
Flathead catfish	--	1	1(1)	--(1)	--(1)	1(1)	--(1)	8
Atlantic needlefish	--	--	--	--	2	2	4	8
Warmouth	4	1	--	--	--(1)	1	--	7
Bluegill	69(2)	58	15(4)	3(25)	20(19)	43(43)	9(9)	319
Longear sunfish	10	7	--	--	1(1)	1	2	22
Redear sunfish	7	1	--	--(3)	--	1(6)	1(6)	25
Largemouth bass	23(1)	7	6	1	29	21	1	89
White crappie	109(39)	45(1)	2(5)	2(14)	9(2)	--(3)	--(2)	233
Black crappie	--	1	--(5)	1	1(7)	--(5)	--(1)	21
Freshwater drum	--	40(1)	2	--(2)	1(6)	1(3)	--	56
Total number of individuals	424(45)	293(8)	551(17)	25(46)	297(44)	114(62)	557(19)	2502
Number of species	15	22	15	15	17	18	14	35

Table 11

Mean Values for Water-Quality Parameters Measured at the Surface (S) and Below the Surface (SS) at Cooks Bend

Parameter	Transect Location*	Dec 79		May 80		Jun 80		Jul 80 (1)		Jul 80 (2)		Aug 80 (1)		Aug 80 (2)		Sep 80	
		S	SS	S	SS	S	SS	S	SS	S	SS	S	SS	S	SS	S	SS
Current speed, m/sec	AB	0.10	0.70	0.30	0.00	0.00	0.30	0.13	—	0.08	0.17	0.03	0.10	0.00	0.00	0.00	[illegible]
	B	0.04	0.33	0.18	0.00	0.00	[illegible]	0.20	—	0.02	0.02	0.01	0.02	0.00	0.00	0.00	[illegible]
	BB	0.02	0.67	0.30	0.03	0.03	[illegible]	0.14	—	0.13	0.20	0.04	0.05	0.00	0.00	0.00	0.00
Temperature, °C	AB	8.9	8.3	18.1	18.0	27.2	27.2	31.1	29.2	30.5	29.8	33.0	31.5	31.8	30.7	29.7	29.6
	B	8.5	8.3	18.0	18.0	28.6	27.8	32.0	29.6	30.8	30.0	32.2	31.2	31.8	31.0	29.2	29.6
	Bb	8.4	8.1	18.1	18.0	29.6	28.4	32.1	30.3	30.7	30.1	32.8	31.5	31.8	30.6	29.7	29.6
Dissolved Oxygen, mg/ℓ	AB	9.2	9.2	7.6	7.4	6.9	6.9	11.1	8.1	7.5	5.2	8.5	6.0	8.3	2.8	5.6	5.2
	B	9.2	9.2	7.9	7.8	8.0	7.0	12.1	8.4	7.6	5.3	8.8	6.0	7.7	3.5	5.1	3.5
	BB	9.4	9.3	7.9	8.0	8.8	7.7	11.6	8.5	7.2	5.0	8.1	6.1	5.4	1.9	5.5	4.0
pH	AB	7.1	6.9	6.9	6.8	7.3	7.2	8.3	7.8	7.0	7.3	7.8	7.0	7.3	7.0	7.1	7.0
	B	7.0	7.0	6.9	6.9	7.3	9.0	8.3	7.8	7.3	7.4	7.6	7.1	7.3	6.8	6.9	7.0
	BB	7.1	7.1	7.1	6.9	7.3	7.2	8.4	7.9	7.2	7.2	7.6	6.8	6.9	6.8	6.9	7.0
Conductivity, μmhos/cm	AB	102	102	94	94	106	105	154	152	148	140	154	152	148	149	167	167
	B	104	104	95	94	104	105	158	158	146	144	149	148	162	155	169	166
	BB	105	116	94	94	101	101	163	166	146	145	144	143	159	155	167	168
Secchi Visibility, m	B	—	—	—	0.30	—	0.24	—	0.58	—	0.60	—	0.69	—	1.21	—	0.88
	C	—	0.33	—	0.29	—	0.27	—	0.55	—	0.52	—	0.67	—	1.22	—	0.92
Turbidity, NTU	B	—	—	33.0	33.0	28.2	28.2	19.2	19.2	22.8	22.8	6.8	6.8	5.2	7.4	—	—
	C	23.5	23.5	34.0	34.0	24.5	24.5	24.5	24.5	36.0	36.0	6.0	6.0	5.4	5.4	—	—
Carbon Dioxide, mg/ℓ	B			3.6	3.6	3.0	3.0	0.0	0.0	2.5	2.5	3.5	3.5	1.0	1.0	—	—
	C	5.5	5.5	3.0	3.0	2.0	2.0	0.0	0.0	4.5	4.5	3.0	3.0	3.2	3.2	—	—
Alkalinity, mg/ℓ	B	—	—	34.5	—	28.5	—	16.8	—	35.8	—	20.2	—	46.0	—	—	—
	C	31.5	—	34.0	—	28.5	—	15.0	—	43.5	—	23.0	—	48.5	—	—	—
Ammonia Nitrogen, mg/ℓ	B			0.17	0.17	0.06	0.06	0.07	0.07	0.53	0.59	0.01	0.01	0.26	4.10	—	—
	C	0.25	0.25	0.20	0.20	0.03	0.03	0.03	0.03	0.64	0.72	0.01	0.01	0.13	0.44	—	—
Total Phosphorus, mg/ℓ	B			0.29	0.29	0.11	0.11	0.21	0.21	0.41	0.32	0.77	0.77	0.04	0.07	—	—
	C	0.32	0.32	0.32	0.32	0.13	0.13	0.33	0.33	0.18	0.20	0.40	0.40	0.05	0.06	—	—
Orthophosphorus, mg/ℓ	B	0.16		0.23	0.24	0.00	0.00	0.08	0.06	0.06	0.06	0.11	0.13	0.00	0.02	—	—
	C	0.15	0.15	0.20	0.20	0.00	0.00	0.10	0.10	0.02	0.04	0.07	0.07	0.00	0.02	—	—

* Entries in this column denote transect locations:
AB - above bendway
B - within bendway
BB - below bendway
C - combined above and below bendway

Table 12

Total Catch of Macroinvertebrates Collected in Cooks Bend

Family	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Jul 80	Total Collection
	Collection Date - Number of Individuals							
Worms:								
Tubificidae	105	41	322	120	252	122	385	1347
Naididae	0	8	6	0	4	10	125	153
Lumbriculidae	0	0	0	0	0	0	22	22
Mollusks:								
Pelecypods	0	0	0	1	0	0	20	21
Sphaeriidae	0	0	12	0	17	57	1	87
Unionidae	11	0	0	0	0	0	0	11
Insects:								
Ephemeridae	153	13	14	62	13	20	10	285
Caenidae	25	0	0	3	5	3	0	36
Macromiidae	11	0	0	0	0	0	0	11
Gomphidae	4	0	0	3	0	3	0	10
Polycentropodidae	6	0	3	8	7	12	0	36
Leptoceridae	42	2	3	1	0	9	1	58
Hydropsychidae	0	0	0	1	0	10	3	14
Elmidae	7	1	2	0	0	1	0	11
Chaoboridae	370	59	432	12	23	10	257	1163
Ceratopogonidae		3	7	22	18	8	24	82
Chironomidae	1050	119	114	116	80	124	496	2099
Summary Statistics:								
Individuals:								
N	1784	246	915	349	419	389	1344	5446
Total N	1807	249	923	353	427	392	1346	5497
%	98.7	98.8	99.1	98.9	98.1	99.2	99.9	99.1
Families:								
N	11	8	10	11	9	13	11	17
Total N	21	10	13	13	15	16	13	38
%	52.4	80.0	76.9	84.6	60.0	81.3	84.6	44.7
Diversity:								
H'	1.96	2.06	1.83	2.31	2.05	2.67	2.22	2.47
$\bar{x}$ H'								2.16

Table 13

Indices of Similarity for Cooks Bend

Seasonal Collections

Procedure	Sampling Date	Comparison Date - Index					
		Mar 79	Aug 79	Dec 79	May 80	Jun 80	Jul 80
Jaccard Coefficient	Jan 79	29.2	25.9	30.8	24.1	37.0	17.2
	Mar 79		53.3	35.3	31.6	52.9	43.8
	Aug 79			36.8	40.0	52.6	44.4
	Dec 79				47.4	52.6	52.9
	May 80					40.9	40.0
	Jun 80						45.0
Morisita Index	Jan 79	0.97	0.51	0.72	0.40	0.69	0.83
	Mar 79		0.68	0.81	0.57	0.79	0.94
	Aug 79			0.58	0.69	0.56	0.76
	Dec 79				0.84	0.92	0.87
	May 80					0.83	0.77
	Jun 80						0.88

Table 14

Species and Relative Abundance of Fish Captured at Cooks Bend by Sampling Date and Gear Type

Species	Jan 79 % ES	Jan 79 % HN	Jan 79 % MT	Jan 79 % TL	Mar 79 % ES	Mar 79 % HN	Mar 79 % MT	Mar 79 % TL	Aug 79 % ES	Aug 79 % HN	Aug 79 % MT	Aug 79 % TL	Dec 79 % ES	Dec 79 % HN	Dec 79 % MT	Dec 79 % TL
Spotted gar	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Longnose gar	—	—	—	—	—	—	—	—	0.3	—	—	0.3	—	—	—	—
Alligator gar	—	—	—	—	0.4	—	—	0.4	—	—	—	—	—	—	—	—
Bowfin	0.7	—	—	0.6	—	—	—	—	—	—	—	—	—	—	—	—
American eel	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Skipjack herring	—	—	—	—	0.4	—	—	0.4	—	—	—	—	1.3	—	—	0.9
Gizzard shad	1.4	—	—	1.2	44.2	15.8	—	40.8	60.4	—	—	54.1	15.6	—	—	10.3
Threadfin shad	28.3	—	—	25.5	12.7	—	—	11.2	21.0	—	—	18.9	5.2	—	—	3.4
Mooneye	—	—	—	—	1.3	—	—	1.2	—	—	—	—	—	—	—	—
Carp	0.7	—	—	0.6	—	—	—	—	—	—	—	—	—	—	—	—
Cypress minnow	1.4	—	—	1.2	—	—	—	—	—	—	—	—	—	—	—	—
Silvery minnow	2.8	—	—	2.5	—	—	—	—	—	—	—	—	18.2	—	—	12.0
Golden shiner	1.4	—	—	1.2	—	—	—	—	—	—	—	—	3.9	—	—	2.6
Emerald shiner	—	—	—	—	—	—	—	—	—	—	—	—	39.0	—	—	25.6
Silverside shiner	—	—	—	—	—	—	—	—	—	—	—	—	2.6	—	—	1.7
Ironcolor shiner	—	—	—	—	—	—	—	—	—	—	75.0	5.7	—	—	—	—
Fluvial shiner	0.7	—	—	0.6	—	—	—	—	—	—	—	—	—	—	—	—
Silverstripe shiner	—	—	—	—	—	—	—	—	—	—	—	—	1.3	—	—	0.9
Weed shiner	—	—	—	—	—	—	—	—	—	—	—	—	1.3	—	—	0.9
Blacktail shiner	17.2	—	—	15.5	7.7	—	—	6.9	0.9	—	—	0.8	2.6	—	—	1.7
Mimic shiner	—	—	—	—	—	—	—	—	—	—	—	—	1.3	—	—	0.9
Bluntnose minnow	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Bullhead minnow	2.1	—	—	1.9	4.3	—	—	3.8	0.6	—	14.3	1.6	1.3	—	100.0	1.7
Quillback	—	—	—	—	—	—	—	—	—	—	—	—	1.3	—	—	0.9
Highfin carpsucker	0.7	7.1	—	1.2	—	—	—	—	—	—	—	—	—	—	—	—
Smallmouth buffalo	0.7	—	—	0.6	3.4	—	—	3.1	0.3	—	—	0.3	—	—	—	—
Spotted sucker	3.4	—	—	3.1	—	—	—	—	—	—	—	—	—	—	—	—
Blacktail redhorse	1.4	—	—	1.2	—	—	—	—	—	—	—	—	—	—	—	—
Blue catfish	—	—	—	—	—	15.8	—	1.2	—	10.0	—	0.3	—	—	—	—
Black bullhead	—	—	—	—	—	5.3	—	0.4	—	—	—	—	—	—	—	—
Brown bullhead	—	7.1	—	0.6	—	—	—	—	—	—	—	—	—	—	—	—
Channel catfish	—	7.1	—	0.6	0.4	21.1	—	1.9	1.2	—	—	1.1	—	—	—	—
Flathead catfish	—	—	—	—	0.4	5.3	—	0.8	10.7	—	—	9.6	—	5.1	—	1.7
Atlantic needlefish	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Blackstripe topminnow	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Blackspotted topminnow	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mosquitofish	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Brook silverside	7.6	—	—	6.8	—	—	—	—	—	—	—	—	1.3	—	—	0.9
Rock bass	—	—	—	—	—	10.5	—	0.8	—	—	—	—	—	—	—	—
Flier	—	—	—	—	—	—	—	—	—	—	—	—	—	2.6	—	0.9
Green sunfish	0.7	—	50.0	1.2	—	—	—	—	—	—	—	—	—	—	—	—
Warmouth	—	7.1	—	0.6	—	—	37.7	1.2	—	—	—	—	—	7.7	—	2.6
Bluegill	10.3	14.3	—	10.6	7.3	—	62.5	8.5	0.3	40.0	—	1.4	—	33.3	—	11.1
Longear sunfish	2.8	—	—	2.5	9.4	15.8	—	9.6	0.6	10.0	3.6	1.1	—	15.4	—	5.1
Redear sunfish	4.1	7.1	—	4.3	0.4	—	—	0.4	—	—	—	—	—	—	—	—
Spotted sunfish	—	—	—	—	0.9	—	—	0.8	—	—	—	—	—	—	—	—
Spotted bass	5.5	—	—	5.0	0.9	—	—	0.8	—	—	—	—	—	—	—	—
Largemouth bass	3.6	—	—	3.1	1.3	—	—	1.2	2.7	10.0	—	2.7	1.3	—	—	0.9
White crappie	2.1	35.7	—	5.0	3.9	10.5	—	4.2	0.9	10.0	—	1.1	—	20.5	—	6.8
Black crappie	—	7.1	—	0.6	—	—	—	—	—	—	—	—	1.3	12.8	—	5.1
Swamp darter	—	—	—	—	—	—	—	—	—	—	7.1	0.5	—	—	—	—
Freshwater drum	—	—	—	—	0.4	—	—	0.4	—	20.0	—	0.5	—	2.6	—	0.9
Unidentified to species	0.7	7.1	50.0	1.8	0.4			0.4					1.3			0.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Species	May 80 %	May 80 % HN	May 80 % S	May 80 % TL	Jun 80 % ES	Jun 80 % HN	Jun 80 % S	Jun 80 % TL	Aug 80 % ES	Aug 80 % HN	Aug 80 % S	Aug 80 % TL	Sample Periods Combined, %
Spotted gar	—	—	—	—	—	—	—	—	—	0.5	—	0.1	0.4
Longnose gar	—	—	—	—	0.9	1.4	—	1.0	—	—	—	—	0.1
Alligator gar	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Bowfin	—	—	—	—	—	—	—	—	—	—	—	—	0.04
American eel	—	0.3	—	0.2	—	—	—	—	—	—	—	—	0.04
Skipjack herring	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Gizzard shad	48.4	—	—	17.0	50.9	—	—	26.6	2.1	—	0.2	0.4	19.3
Threadfin shad	25.3	—	—	8.9	11.1	—	—	5.8	13.7	—	—	1.7	8.9
Mooneye	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Carp	0.5	—	—	0.2	0.9	—	—	0.5	—	—	—	—	0.1
Cypress minnow	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Silvery minnow	0.5	—	—	0.2	—	—	50.0	6.3	14.7	—	21.4	14.5	5.9
Golden shiner	—	—	—	—	0.9	—	—	0.5	—	—	—	—	0.3
Emerald shiner	—	—	—	—	—	—	—	—	4.2	—	—	0.5	1.4
Silverside shiner	2.1	—	—	0.7	0.9	—	—	0.5	28.4	—	8.5	8.5	3.0
Ironcolor shiner	—	—	—	—	—	—	—	—	—	—	—	—	0.9
Fluvial shiner	—	—	—	—	—	—	—	—	7.4	—	21.6	13.7	4.4
Silverstripe shiner	0.5	—	—	0.2	0.9	—	—	0.5	2.1	—	—	0.3	0.2
Weed shiner	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Blacktail shiner	2.1	—	38.1	2.2	1.9	—	—	1.0	7.4	—	33.0	20.4	9.1
Mimic shiner	—	-	—	—	—	—	—	—	—	—	—	—	0.04
Bluntnose minnow	—	—	—	—	—	—	—	—	—	—	0.2	0.1	0.04
Bullhead minnow	—	—	9.5	0.4	1.9	—	26.9	4.3	—	—	1.5	0.9	1.6
Quillback	—	—	—	—	1.9	—	—	1.0	—	—	0.4	0.3	0.2
Highfin carpsucker	—	—	—	—	0.9	—	—	0.5	—	—	—	—	0.4
Smallmouth buffalo	—	—	—	—	—	—	—	—	—	—	—	—	0.4
Spotted sucker	—	—	—	—	—	—	—	—	—	—	—	—	0.2
Blacktail redhorse	—	—	—	—	—	—	—	—	—	0.5	—	0.1	0.1
Blue catfish	—	—	—	—	—	1.4	—	0.5	—	—	—	—	0.2
Black bullhead	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Brown bullhead	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Channel catfish	—	0.3	—	0.2	—	—	—	—	—	—	—	—	0.5
Flathead catfish	—	3.0	—	1.8	2.8	6.8	—	3.9	—	0.5	—	0.1	2.4
Atlantic needlefish	—	—	—	—	0.9	—	—	0.5	4.2	—	0.4	0.8	0.3
Blackstripe topminnow	0.5	—	4.8	0.6	—	—	—	—	—	—	—	—	0.1
Blackspotted topminnow	—	—	—	—	—	—	—	—	—	—	0.4	0.3	0.1
Mosquitofish	—	—	4.8	0.2	—	—	7.7	1.0	5.3	—	5.7	4.0	1.4
Brook silverside	—	—	—	—	—	—	—	—	1.1	—	—	0.1	0.1
Rock bass	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Flier	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Green sunfish	—	—	—	—	—	—	—	—	—	—	0.4	0.3	0.2
Warmouth	—	1.2	—	0.7	—	1.4	00	0.5	00	1.4	—	0.4	0.6
Bluegill	4.7	66.7	4.8	41.3	9.3	53.4	17.7	24.6	7.4	42.5	2.6	14.6	18.3
Longear sunfish	1.1	2.7	—	2.0	7.8	6.8	—	3.9	1.1	4.5	2.4	2.8	3.3
Redear sunfish	—	1.8	—	1.1	—	4.1	—	1.4	—	11.8	0.7	3.7	1.9
Spotted sunfish	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Spotted bass	0.5	—	4.8	0.4	—	—	—	—	—	—	0.2	0.1	0.5
Largemouth bass	9.5	—	—	3.3	10.2	—	—	5.3	1.1	—	—	0.1	2.0
White crappie	3.7	18.7	—	12.7	—	13.7	—	4.8	—	23.5	—	6.7	6.7
Black crappie	—	7.3	—	4.4	—	8.2	—	2.9	—	14.0	—	4.0	2.8
Swamp darter	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Freshwater drum	0.5	—	—	0.2	—	2.7	—	1.0	—	0.5	—	0.1	0.3
Unidentified to species	—	—	33.3	1.3	0.9	—	7.7	1.5	—	0.5	0.2	0.3	0.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* Gear types are identified in column headings as follows:
ES - electroshocker.
HN - hoop net.
MT - minnow trap.
TL - total for all gear types.

Table 15

Species and Number of Fish Captured at the Within-Bendway Stations at Cooks Bend

Species	Number by Sampling Date*							Total
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	
Spotted gar	--	--	--	--	--	--	--(1)	1
Longnose gar	--	--	--	--	--	--(1)	--	1
Bowfin	1	--	--	--	--	--	--	1
Skipjack herring	--	--	--	1	--	--	--	1
Gizzard shad	1	39	139	5	55	30	1	270
Threadfin shad	5	3	31	1	18	4	--	62
Mooneye	--	1	--	--	--	--	--	1
Carp	1	--	--	--	--	--	--	1
Cypress minnow	2	--	--	--	--	--	--	2
Weed shiner	--	--	--	1	--	--	--	1
Golden shiner	1	--	--	3	--	1	--	5
Emerald shiner	--	--	--	11	--	--	4	15
Silverside shiner	--	--	--	1	4	1	27	33
Fluvial shiner	--	--	--	--	--	--	7	7
Silverstripe shiner	--	--	--	1	--	1	1	3
Blacktail shiner	16	11	--	2	1	1	6	37
Mimic shiner	--	--	--	1	--	--	--	1
Bullhead minnow	2	2	--	1	--	--	--	5
Highfin carpsucker	--(1)	--	--	--	--	1	--	2

(Continued)

* Catch is indicated separately for elec^troshocking and hoop nets, with hoop-net catch in parentheses.

Table 15 (Concluded)

Species	Number by Sampling Date							Total
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	
Smallmouth buffalo	—	2	1	—	—	—	—	3
Spotted sucker	2	—	—	—	—	—	—	2
Blacktail redhorse	1	—	—	—	—	—	—	1
Blue catfish	—	—(2)	—(1)	—	—	—	—	3
Black bullhead	—	—(1)	—	—	—	—	—	1
Channel catfish	—(1)	1(4)	2	—	—	—	—	3
Flathead catfish	—	1(1)	21	—	—(2)	1(4)	—	30
Atlantic needlefish	—	—	—	—	—	—	3	3
Blackstripe topminnow	—	—	—	—	—	1	—	1
Mosquitofish	—	—	—	—	—	—	5	5
Brook silverside	1	—	—	1	—	—	—	2
Rock bass	—	—(1)	—	—	—	—	—	1
Green sunfish	1	—	—	—	—	—	—	1
Warmouth	—(1)	—	—	—	—(3)	—	—(3)	7
Bluegill	5(2)	5	—(1)	—(9)	5(97)	3(24)	1(61)	213
Longear sunfish	2	6(3)	—	—(2)	—(4)	2(4)	—(5)	28
Redear sunfish	2(1)	—	—	—	—(3)	—(2)	—(11)	19
Spotted bass	3	1	—	—	—	—	—	4
Largemouth bass	3	1	6	1	14	7	—	32
White crappie	1(5)	8(2)	1(1)	—(6)	4(30)	—(5)	—(22)	85
Black crappie	—(1)	—	—	1(2)	—(4)	—(4)	—(7)	19
Freshwater drum	—	1	—(1)	—(1)	—	—(1)	—	4
Total number of individuals	50(12)	82(14)	201(4)	40(20)	102(143)	52(45)	69(110)	944
Number of species	22	17	10	19	13	16	16	43

Table 16

Species and Number of Fish Captured at the Above-Bendway Stations at Cooks Bend

Species	Number by Sampling Date*							
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
Alligator gar	—	1	—	—	—	—	—	1
Gizzard shad	1	28(3)	33	2	24	10	1	102
Threadfin shad	10	1	26	—	8	1	—	46
Mooneye	—	2	—	—	—	—	—	2
Carp	—	—	—	—	1	1	—	2
Silvery minnow	1	—	—	—	—	—	—	1
Emerald shiner	—	—	—	3	—	—	—	3
Fluvial shiner	1	—	—	—	—	—	—	1
Silverstripe shiner	—	—	—	—	1	—	—	1
Blacktail shiner	9	2	3	—	1	1	—	16
Bullhead minnow	1	7	2	—	—	—	—	10
Spotted sucker	1	—	—	—	—	—	—	1
Quillback	—	—	—	—	—	1	—	1
Blacktail redhorse	1	—	—	—	—	—	—(1)	2
Blue catfish	—	—(1)	—	—	—	—	—	1
Brown bullhead	—(1)	—	—	—	—	—	—	1
Channel catfish	—	—	1	—	—	—	—	1
Flathead catfish	—	—	3	—(2)	—	2(1)	—	8
Brook silverside	2	—	—	—	—	—	1	3
Rock bass	—	—(1)	—	—	—	—	—	1
Warmouth	—	—	—	—(1)	—	—	—	1

(Continued)

* Catch is indicated separately for electroshocking and hoop nets, with hoop-net catch in parentheses.

Table 16 (Concluded)

Species	Number by Sampling Date							Total
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	
Bluegill	5	2	1(3)	—(4)	—(35)	4(3)	1(13)	71
Longear sunfish	1	7	2	—	1(3)	1	—(2)	17
Spotted bass	3	1	—	—	1	—	—	5
Largemouth bass	—	1	2(1)	—	3	2	—	9
White crappie	1	2	1	—(1)	1(20)	—(1)	—(15)	42
Black crappie	—	—	—	—	—(10)	—(1)	—(17)	28
Stizostedion sp.	—(1)	—	—	—	—	—	—	1
Freshwater drum	—	—	—	—	1	—(1)	1	3
Total number of individuals	39(2)	55(5)	74(4)	5(8)	42(68)	23(8)	3(47)	383
Number of species	16	13	10	6	12	13	12	29

Table 17

Species and Number of Fish Captured at the Below-Bendway Stations at Cooks Bend

Species	Number by Sampling Date*							Total
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	
Longnose gar	--	--	1	--	--	--	--	1
Skipjack herring	--	1	--	--	--	--	--	1
Gizzard shad	--	7	5	5	12	9	--	38
Threadfin shad	--	1	4	3	13	1	13	35
Silvery minnow	3	--	--	5	1	--	--	9
Emerald shiner	--	--	--	16	--	--	--	16
Silverside shiner	--	--	--	1	--	--	--	1
Silverstripe shiner	--	--	--	--	--	--	1	1
Blacktail shiner	--	1	--	--	2	--	1	4
Bullhead minnow	--	--	--	--	--	2	--	2
Quillback	--	--	--	1	--	--	--	1
Smallmouth buffalo	1	1	--	--	--	--	--	2
Spotted sucker	2	--	--	--	--	--	--	2
Blue catfish	--	--	--	--	--	--(1)	--	1
Channel catfish	--	--	1	--	--	--	--	1
Flathead catfish	--	--	10	--	--(1)	--	--(1)	12
Atlantic needlefish	--	--	--	--	--	--	1	1
Flier	--	--	--	--(1)	--	--	--	1
Warmouth	--	--	--	--(2)	--(1)	--	--	3
Bluegill	2	10	--	--	2(33)	--(9)	3(17)	76

(Continued)

* Catch is indicated separately for electroshocking and hoop nets, with hoop-net catch in parentheses.

Table 17 (Concluded)

Species	Number by Sampling Date							Total
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	
Longear sunfish	--	9	--(1)	--(4)	1	--(1)	1(3)	20
Redear sunfish	1	--	--	--	--(1)	--	--(10)	12
Spotted sunfish	--	2	--	--	--	--	--	2
Largemouth bass	1	1	1	--	1	1	1	6
White crappie	1	--	1	--(1)	--(6)	--(4)	--(8)	21
Black crappie	--	--	--	--(3)	--(6)	--(1)	--(6)	16
Freshwater drum	--	--	--(1)	--	--	--	--	1
Total number of individuals	11	33	23(2)	31(11)	32(48)	13(16)	21(45)	286
Number of species	7	9	9	11	12	9	11	27

Table 18

Species and Number of Fish Captured at the Within-Cut Stations at Cooks Bend

Species	Number by Sampling Date* May 80	Jun 80	Aug 80	Total
Longnose gar	--	1	--	1
American eel	--(1)	--	--	1
Gizzard shad	1	6	--	7
Threadfin shad	9	6	--	15
Quillback	--	1	--	1
Channel catfish	--(1)	--	--	1
Flathead catfish	--(7)	--	--	7
Atlantic needlefish	--	1	--	1
Warmouth	--	--(1)	--	1
Bluegill	2(49)	3(1)	2(3)	60
Longear sunfish	--(2)	--	--	2
Redear sunfish	--(2)	--	--	2
Largemouth bass	--	1	--	1
White crappie	2(6)	--	--(7)	15
Black crappie	--(4)	--	--(1)	5
Total number of individuals	14(72)	19(2)	2(11)	120
Number of species	10	8	3	15

* Catch is indicated separately for electroshocker and hoop nets, with hoop-net catch in parentheses.

Table 19

Mean Values for Water-Quality Parameters Measured at the Surface (S) and Below the Surface (SS) at Big Creek Bendway

Parameter	Transect Location*	Dec 79		May 80		Jun 80		Jul 80 (1)		Jul 80 (2)		Aug 80 (1)		Aug 80 (2)		Sep 80	
		S	SS	S	SS	S	SS	S	SS	S	SS	S	SS	S	SS	S	SS
Current speed, m/sec	AB	0.24	0.67	0.47	0.77	0.07	0.07	0.10	0.20	0.10	0.13	0.08	0.03	0.00	0.00	0.14	0.10
	B	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.02	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.00
	BB	0.39	0.92	0.43	0.88	0.07	0.10	0.33	0.30	0.05	0.10	0.20	0.03	0.00	0.00	0.00	0.00
Temperature, °C	AB	8.4	8.2	17.8	17.7	27.1	27.2	29.1	28.9	30.9	30.6	30.4	30.4	31.6	31.4	29.9	29.8
	B	11.5	10.5	18.2	17.8	25.9	25.6	31.0	29.6	31.9	30.1	32.0	30.7	32.9	32.1	29.8	29.4
	BB	8.4	8.4	17.8	17.9	26.6	26.8	29.1	28.9	30.9	30.5	30.4	30.0	31.5	31.5	30.2	29.7
Dissolved Oxygen, mg/ℓ	AB	9.5	9.6	9.8	9.7	8.7	9.1	8.2	8.3	7.8	8.0	7.0	6.8	5.6	5.4	7.1	6.8
	B	5.8	5.8	7.3	7.1	6.6	6.3	8.6	6.8	8.6	6.1	6.9	4.8	5.5	4.7	5.9	4.8
	BB	9.5	9.6	9.7	9.8	7.8	7.8	6.9	5.4	7.3	7.7	6.8	6.9	6.0	6.1	6.5	6.1
pH	AB	7.2	7.0	6.8	6.8	7.3	7.3	7.3	7.3	7.2	7.1	7.3	7.3	7.8	8.1	7.5	7.4
	B	6.6	6.7	6.8	6.8	6.9	6.9	7.2	6.9	7.3	7.2	7.2	7.1	7.7	7.1	7.2	7.2
	BB	7.3	7.4	7.0	6.9	7.0	7.0	7.4	7.3	7.3	7.3	7.4	7.3	7.5	7.5	7.2	7.2
Conductivity, μmhos/cm	AB	110	113	104	103	115	115	166	166	161	166	156	156	161	160	178	178
	B	153	143	107	101	177	188	179	176	174	180	190	194	207	207	20[illegible]	216
	BB	110	110	105	104	115	116	164	164	163	162	154	154	161	161	176	176
Secchi Visibility, m	B	—	0.36	—	0.23	—	0.25	—	0.41	—	0.27	—	0.31	—	0.31	—	0.29
	C	—	0.42	—	0.33	—	0.28	—	0.39	—	0.44	—	0.40	—	0.80	—	0.44
Turbidity, NTU	B	23.5		31.2		21.8		39.0	39.0	38.5	38.5	10.8	10.8	11.8	11.9	—	—
	C	22.0	22.0	28.0	28.0	25.5	25.5	34.0	34.0	37.0	37.0	12.0	12.0	6.2	6.2	—	—
Carbon Dioxide, mg/ℓ	B	1.8	1.8	5.9	5.9	16.8	16.8	5.0	5.0	9.0	9.0	10.5	10.5	4.5	4.5	—	—
	C	1.3	1.3	4.0	4.0	4.3	4.2	5.0	5.0	7.0	7.0	6.5	6.5	4.0	4.0	—	—
Alkalinity, mg/ℓ	B	60.5	—	42.0	—	63.5	—	26.4	—	65.8	—	39.5	—	70.0	—	—	—
	C	35.5	—	38.5	—	35.5	—	30.5	—	35.0	—	19.0	—	70.0	—	—	—
Ammonia Nitrogen, mg/ℓ	B	0.12	0.12	0.15	0.15	0.05	0.05	0.02	0.04	0.44	0.65	0.02	0.02	0.04	0.08	—	—
	C	0.05	0.05	0.05	0.05	0.07	0.07	0.08	0.08	0.31	0.31	0.03	0.03	0.16	0.33	—	—
Total Phosphorus, mg/ℓ	B	0.41	0.41	0.25	0.25	0.47	0.47	0.42	0.42	0.28	0.28	0.84	0.84	0.10	0.10	—	—
	C	0.56	0.56	0.32	0.32	0.14	0.14	0.49	0.49	0.33	0.33	2.11	2.11	0.23	0.15	—	—
Orthophosphorus, mg/ℓ	B	0.18	0.18	0.17	0.17	0.00	0.00	0.20	0.22	0.11	0.38	0.17	0.17	0.04	0.07	—	—
	C	0.23	0.23	0.17	0.17	0.00	0.00	0.11	0.11	0.05	0.05	0.07	0.07	0.04	0.04	—	—

* Entries in this column denote transect locations:
AB - above bendway
B - within bendway
BB - below bendway
C - combined above and below bendway

Table 20

Total Catch of Macroinvertebrates Collected in Big Creek Bendway

Family	Collection Date - Number of Individuals							Total
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Jul 80	Collection
Worms:								
Tubificidae	220	93	191	234	228	924	455	2345
Naididae	0	4	3	43	21	61	17	149
Mollusks:								
Pelecypods	0	0	0	0	0	0	12	12
Sphaeriidae	2	9	1	0	1	13	1	27
Crustaceans:								
Gammaridae	14	0	0	0	5	0	0	19
Insects:								
Ephemeridae	177	213	63	59	7	20	22	561
Heptogeniidae	16	0	0	0	0	0	0	16
Caenidae	10	2	1	0	0	14	1	28
Gomphidae	6	5	0	0	1	0	0	12
Polycentropodidae	7	0	0	0	1	3	4	17
Hydropsychidae	60	5	3	4	1	8	0	81
Corixidae	5	1	1	3	0	1	4	15
Elmidae	8	32	2	0	0	33	0	75
Chaoboridae	202	12	998	46	18	107	522	1905
Ceratopogonidae	1	72	9	4	6	12	28	132
Chironomidae	531	154	173	63	123	282	838	2164
Summary Statistics:								
Individuals:								
N	1259	602	1445	458	412	1478	1904	7558
Total N	1273	615	1450	464	415	1483	1911	7611
%	98.9	97.9	99.7	98.7	99.3	99.6	99.63	99.3
Families:								
N	14	12	11	8	11	12	11	16
Total N	22	20	16	14	14	16	17	44
%	63.6	60.0	68.8	57.1	78.6	75.0	64.7	36.4
Diversity:								
H'	2.48	2.60	1.47	2.23	1.83	1.83	1.88	2.41
$\bar{x}$ H'								2.04

Table 21

Indices of Similarity for Big Creek Bendway

Seasonal Collections

Procedure	Sampling Date	Comparison Date - Index Mar 79	Aug 79	Dec 79	May 80	Jun 80	Jul 80
Jaccard Coefficient	Jan 79	44.8	35.7	33.3	38.5	52.0	39.3
	Mar 79		56.5	30.8	36.0	44.0	32.1
	Aug 79			36.4	36.4	52.4	37.5
	Dec 79				40.0	50.0	40.9
	May 80					42.9	47.6
	Jun 80						57.1
Morisita Index	Jan 79	0.77	0.50	0.64	0.71	0.59	0.94
	Mar 79		0.22	0.60	0.54	0.46	0.58
	Aug 79			0.39	0.31	0.33	0.66
	Dec 79				0.94	0.96	0.66
	May 80					0.98	0.76
	Jun 80						0.67

Table 22

Species and Relative Abundance of Fish Captured at Big Creek Roadway by Sampling Date and Gear Type*

Species	Jan 79 % ES	Jan 79 % HN	Jan 79 % MT	Jan 79 % TL	Mar 79 % ES	Mar 79 % HN	Mar 79 % MT	Mar 79 % TL	Aug 79 % ES	Aug 79 % HN	Aug 79 % MT	Aug 79 % TL
Southern brook lamprey	0.2	—	—	0.1	—	—	—	—	—	—	—	—
Spotted gar	4.5	—	—	4.0	[illegible]	—	—	3.8	1.6	3.0	—	1.6
Longnose gar	0.3	—	—	0.3	0.7	—	—	0.3	0.4	2.0	—	0.6
Bowfin	1.1	—	—	1.0	0.7	—	—	0.3	0.2	2.0	—	0.4
American eel	—	—	—	—	—	1.6	—	0.2	0.4	6.1	—	1.1
Alabama shad	—	—	—	—	—	—	—	—	—	—	—	—
Skipjack herring	—	—	—	—	—	—	—	—	0.2	—	—	0.1
Gizzard shad	3.1	—	—	2.7	48.6	46.9	—	28.2	65.7	1.0	—	48.1
Threadfin shad	—	—	—	—	—	—	—	—	13.2	—	—	9.6
Mooneye	—	1.3	—	0.1	1.4	—	—	0.7	—	—	—	—
Redfin pickerel	—	—	[illegible]	0.1	—	—	—	—	—	—	—	—
Chain pickerel	0.2	—	—	0.1	—	—	—	—	—	—	—	—
Carp	1.2	—	—	1.1	1.7	4.7	—	1.3	0.6	3.0	—	0.8
Cypress minnow	0.2	—	—	0.1	—	—	—	—	—	—	—	—
Silvery minnow	12.0	—	22.2	10.8	0.7	—	—	0.3	—	—	—	—
Bigeye chub	0.5	—	—	0.4	—	—	—	—	—	—	—	—
Golden shiner	0.3	—	11.1	0.4	—	—	—	—	—	—	—	—
Emerald shiner	0.2	—	—	0.1	0.7	—	—	0.3	—	—	—	—
Silverside shiner	—	—	—	—	—	—	—	—	—	—	—	—
Ironcolor shiner	—	—	—	—	—	—	—	—	—	—	10.9	1.4
Fluvial shiner	—	—	—	—	—	—	—	—	—	—	4.3	0.6
Pugnose minnow	0.3	—	—	0.3	—	—	—	—	—	—	—	—
Silverstripe shiner	1.1	—	—	1.0	0.3	—	—	0.2	—	—	—	—
Weed shiner	—	—	—	—	—	—	—	—	—	—	—	—
Blacktail shiner	0.3	—	—	0.3	2.1	—	93.7	40.1	1.6	—	63.0	9.2
Mimic shiner	—	—	—	—	—	—	—	—	—	—	—	—
Bullhead minnow	4.2	—	11.1	3.8	2.1	—	5.5	3.3	—	—	15.2	2.0
Quillback	0.2	1.3	—	0.3	—	—	—	—	—	—	—	—
Highfin carpsucker	0.5	2.6	—	0.6	1.7	—	—	0.9	4.9	2.0	—	3.8
Creek chubsucker	—	1.3	11.1	0.3	—	—	—	—	—	—	—	—
Smallmouth buffalo	0.6	5.0	—	1.1	5.8	—	—	2.8	2.7	1.0	—	2.1
Spotted sucker	—	2.5	—	0.3	1.7	—	—	0.8	—	—	—	—
River redhorse	—	3.8	11.1	0.5	—	1.6	—	0.2	—	—	—	—
Blacktail redhorse	2.2	18.8	—	4.0	0.3	—	—	0.2	0.2	—	—	0.1
Blue catfish	—	6.3	—	0.7	0.3	1.6	—	0.3	0.2	—	—	0.1
Black bullhead	0.3	5.0	—	0.8	—	—	—	—	—	—	—	—
Channel catfish	—	36.3	—	4.0	2.4	10.9	—	2.3	0.6	17.2	—	2.8
Flathead catfish	—	—	—	—	—	7.8	—	0.8	5.6	2.0	—	4.4
Pirate perch	0.2	—	—	0.1	—	—	—	—	—	—	—	—
Atlantic needlefish	—	—	—	—	—	—	—	—	—	—	—	—
Blackstripe topminnow	—	—	—	—	—	—	—	—	—	—	—	—
Blackspotted topminnow	—	—	—	—	—	—	—	—	—	—	—	—
Mosquitofish	—	—	—	—	—	—	—	—	—	—	—	—
White bass	—	—	—	—	—	—	—	—	—	—	—	—
Rock bass	0.3	1.3	—	0.4	—	1.6	—	0.2	—	—	—	—
Green sunfish	0.5	—	—	0.4	—	—	—	—	—	—	—	—
Warmouth	0.8	—	—	0.7	—	—	—	—	—	—	—	—
Orangespotted sunfish	1.4	—	11.1	1.4	—	—	—	—	—	—	—	—
Bluegill	19.5	7.5	11.1	18.1	4.8	7.8	0.8	3.4	0.2	21.2	3.3	3.5
Longear sunfish	3.6	—	—	3.1	1.7	—	—	0.8	—	—	—	—
Redear sunfish	2.2	—	—	1.9	0.7	—	—	0.3	—	—	—	—
Spotted bass	0.3	—	—	0.3	—	—	—	—	—	—	—	—
Largemouth bass	3.9	—	—	3.4	2.1	—	—	1.0	0.6	—	1.1	0.6
White crappie	24.3	2.5	—	21.6	8.2	9.4	—	4.9	1.0	15.2	—	2.8
Black crappie	7.8	2.5	—	7.1	1.0	3.1	—	0.8	0.2	23.2	—	3.4
Southern sand darter	—	—	—	—	—	—	—	—	—	—	—	—
Freshwater drum	2.0	1.3	—	1.9	1.7	3.1	—	1.1	0.2	1.0	—	0.3
Unidentified species	—	1.7	—	0.1	0.7	—	—	0.3	0.2	—	2.2	0.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Species	Dec 79 % ES	Dec 79 % HN	Dec 79 % MT	Dec 79 % S	Dec 79 % TL	May 80 % ES	May 80 % HN	May 80 % S	May 80 % TL	Jun 80 % ES	Jun 80 % HN	Jun 80 % S	Jun 80 % TL	Aug 80 % ES	Aug 80 % HN	Aug 80 % S	Aug 80 % TL	Sample Periods Combined %
Southern brook lamprey	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Spotted gar	15.4	—	—	—	7.8	4.9	—	—	3.8	3.9	—	—	2.4	1.1	—	—	0.7	3.4
Longnose gar	—	—	—	—	—	0.3	—	—	0.2	0.8	—	—	0.5	—	—	—	—	0.3
Bowfin	—	—	—	—	—	0.4	—	—	0.3	2.8	—	—	1.7	—	0.7	—	0.2	0.6
American eel	—	—	—	—	—	—	4.1	—	0.3	0.8	—	—	0.5	—	0.7	—	0.2	0.4
Alabama shad	—	—	—	—	—	—	—	—	—	0.3	—	—	0.2	—	—	—	—	0.02
Skipjack herring	—	—	—	—	—	0.1	—	—	0.1	0.6	—	—	0.3	—	—	—	—	0.1
Gizzard shad	51.4	—	—	—	25.9	37.9	1.0	—	29.6	43.7	0.7	5.1	27.8	59.7	0.7	4.3	38.0	28.4
Threadfin shad	3.4	—	—	—	1.7	25.3	—	—	19.7	5.9	—	1.3	3.8	7.2	—	13.0	5.2	8.5
Mooneye	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Redfin pickerel	—	—	—	—	—	0.1	—	—	0.1	—	—	—	—	—	—	—	—	0.04
Chain pickerel	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Carp	1.1	—	—	—	0.6	0.5	—	—	0.5	2.8	1.4	—	2.1	—	—	—	—	0.9
Cypress minnow	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Silvery minnow	—	—	—	—	—	0.1	—	3.8	0.7	2.0	—	83.5	12.7	—	—	—	—	3.3
Bigeye chub	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Golden shiner	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Emerald shiner	8.0	—	—	—	4.0	3.1	—	—	2.4	—	—	—	—	—	—	—	—	1.1
Silverside shiner	4.0	—	—	—	2.0	3.3	—	—	2.6	0.6	—	—	0.3	—	—	—	—	1.0
Ironcolor shiner	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.2
Fluvial shiner	—	—	—	25.6	6.3	—	—	9.4	1.5	—	—	—	—	—	—	—	—	1.0
Pugnose minnow	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Silverstripe shiner	0.6	—	—	—	0.3	0.3	—	4.3	0.9	—	—	—	—	—	—	—	—	0.5
Weed shiner	—	—	—	2.3	0.6	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Blacktail shiner	—	—	50.0	31.4	8.0	1.6	—	60.1	11.9	7.0	—	—	4.3	21.6	—	8.7	14.0	12.3
Mimic shiner	—	—	—	—	—	—	—	0.4	0.1	—	—	—	—	—	—	—	—	0.2
Bullhead minnow	0.6	—	—	36.0	9.2	0.2	—	3.8	0.7	—	—	1.3	0.2	—	34.8	—	1.8	2.3
Quillback	4.0	1.2	—	—	2.3	8.8	—	—	6.8	5.1	0.7	—	3.3	—	—	—	—	2.7
Highfin carpsucker	—	—	—	—	—	1.0	3.1	—	1.0	—	—	1.3	0.2	—	—	—	—	1.1
Creek chubsucker	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.4
Smallmouth buffalo	—	—	—	1.2	0.3	0.4	—	—	0.3	—	0.7	—	0.2	—	—	—	—	1.0
Spotted sucker	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.1
River redhorse	—	1.2	—	—	0.3	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Blacktail redhorse	—	2.4	—	—	0.6	0.1	1.0	—	0.1	0.3	0.7	—	0.3	—	—	—	—	0.8
Blue catfish	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.2
Black bullhead	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Channel catfish	0.6	9.4	—	—	2.6	0.4	1.0	—	0.4	0.3	—	—	0.2	—	—	—	—	1.6
Flathead catfish	—	—	—	—	—	—	4.1	—	0.3	—	4.2	—	1.0	—	2.8	—	0.9	1.8
Pirate perch	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Atlantic needlefish	—	—	—	—	—	—	—	—	—	0.6	—	—	0.3	1.1	—	—	0.7	0.1
Blackstripe topminnow	—	—	—	—	—	0.1	—	—	0.1	0.3	—	—	0.2	0.4	—	—	0.2	0.1
Blackspotted topminnow	—	—	—	—	—	—	—	—	—	—	—	—	—	0.4	—	—	0.2	0.02
Mosquitofish	—	—	—	—	—	—	—	4.3	0.7	0.3	—	—	0.2	—	—	—	—	0.2
White bass	—	1.2	—	—	0.3	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Rock bass	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Green sunfish	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Warmouth	—	2.4	—	—	0.6	—	1.0	—	0.1	—	—	—	—	—	—	—	—	0.2
Orangespotted sunfish	—	—	—	—	—	—	—	—	—	0.3	—	—	0.2	—	—	—	—	0.2
Bluegill	1.1	11.8	—	1.2	3.7	0.9	23.5	1.7	2.5	8.7	29.6	3.8	13.2	5.0	7.8	34.8	7.5	6.9
Longear sunfish	0.6	—	—	—	0.3	0.3	1.0	0.4	0.3	0.6	0.7	1.3	0.7	—	—	—	—	0.8
Redear sunfish	—	1.2	—	—	0.3	0.2	—	—	0.1	—	1.4	—	0.3	—	—	—	—	0.4
Spotted bass	—	—	—	—	—	—	—	0.4	0.1	0.3	—	1.3	0.3	—	4.3	—	0.2	0.1
Largemouth bass	2.9	—	—	—	1.4	2.4	—	0.4	1.9	3.9	—	—	2.4	2.9	—	—	1.8	1.9
White crappie	5.1	55.3	—	—	16.9	6.6	42.9	0.4	8.0	6.8	33.1	—	12.3	0.7	39.7	—	13.1	10.4
Black crappie	1.1	12.9	—	—	[illegible]	0.7	14.3	—	1.5	—	25.4	—	6.2	—	46.1	—	14.7	4.6
Southern sand darter	—	—	—	1.2	0.3	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Freshwater drum	—	1.2	—	—	0.3	—	3.1	—	0.2	0.8	1.4	—	0.9	—	1.4	—	0.5	0.7
Unidentified species	—	—	50.0	1.2	0.6	0.1	—	2.6	0.5	0.6	—	1.3	0.5	—	—	—	—	0.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* Gear types are identified in column headings as follows:
ES - electroshocker
HN - hoop net
MT - minnow trap
TL - total for all gear types

Table 23

Species and Number of Fish Captured at the Within-Bendway Stations at Big Creek Bendway

Species	Number by Sampling Date*							
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
Southern brook lamprey	1	--	--	--	--	--	--	1
Spotted gar	10	10	6(3)	27	32	11	3	102
Longnose gar	2	1	2	--	2	3	--	10
Bowfin	3	1	1(2)	--	4	7	--(1)	19
American eel	--	--(1)	1(6)	--	--	3	--	11
Alabama shad	--	--	--	--	--	1	--	1
Skipjack herring	--	--	1	--	--	1	--	2
Gizzard shad	4	48(1)	302(1)	83	318(1)	129	155(1)	1043
Threadfin shad	--	--	36	6	146	7	18	213
Mooneye	--	1	--	--	--	--	--	1
Chain pickerel	1	--	--	--	--	--	--	1
Carp	4	4(3)	3(2)	1	4	8(1)	--	30
Silvery minnow	63	1	--	--	--	3	--	67
Bigeye chub	1	--	--	--	--	--	--	1
Emerald shiner	--	1	--	5	--	--	--	6
Silverside shiner	--	--	--	6	32	2	--	40
Pugnose minnow	2	--	--	--	--	--	--	2
Silverstripe shiner	1	--	--	--	1	--	--	2
Blacktail shiner	1	1	--	--	2	--	52	56
Bullhead minncw	7	2	--	--	--	--	--	9

(Continued)

* Catch is indicated separately for electroshocker and hoop nets, with hoop-net catch in parentheses.

Table 23 (Concluded)

Species	Number by Sampling Date							
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
Quillback	1	—	—	7	43	16	—	67
Highfin carpsucker	3	2	19	—	4	—	—	28
Smallmouth buffalo	3(4)	4	13	—	3	—	—	27
Spotted sucker	—	1	—	—	—	—	—	1
River redhorse	—(1)	—	—	—	—	—	—	1
Blacktail redhorse	7(8)	—	—	—	—	1	—	16
Blue catfish	—(3)	—	1	—	—	—	—	4
Black bullhead	2(3)	—	—	—	—	—	—	5
Channel catfish	—(18)	1(1)	2(6)	1	5(1)	1	—	36
Flathead catfish	—	—(1)	8	—	—	—	—	9
Pirate perch	1	—	—	—	—	—	—	1
Rock bass	1	—	—	—	—	—	—	1
Green sunfish	2	—	—	—	—	—	—	2
Warmouth	3	—	—	—(1)	—(1)	—	—	5
Orangespotted sunfish	4	—	—	—	—	1	—	5
Bluegill	70(5)	7(5)	—	2(9)	3(6)	19(3)	10	139
Longear sunfish	7	4	—	—	—(1)	—	—	12
Redear sunfish	2	2	—	—(1)	2	—	—	7
Spotted bass	1	—	—	—	—	—	—	1
Largemouth bass	6	1	1	5	10	4	6	33
White crappie	30(1)	10(6)	5(3)	9(33)	58(19)	23(3)	2(5)	207
Black crappie	31(2)	1(2)	1(7)	1(6)	4	—	—(9)	74
Freshwater drum	11(1)	2	1	—	—	3	—(1)	19
Total number of individuals	285(46)	105(20)	403(30)	153(50)	673(29)	243(7)	246(17)	2307
Number of species	35	23	18	14	20	19	10	44

Table 24

Species and Number of Fish Captured at the Above-Bendway

Stations at Big Creek Bendway

Species	Number by Sampling Date*							
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
Spotted gar	5	3	1	—	7	2	—	18
Longnose gar	—	—	—	—	1	—	—	1
American eel	—	—	1	—	—	—	—	1
Gizzard shad	5	36(4)	15	5	21	7(1)	—	95
Threadfin shad	—	—	14	—	51	7	—	72
Redfin pickerel	—	—	—	—	1	—	—	1
Carp	2	—	—	1	1	1	—	5
Silvery minnow	12	—	—	—	—	—	—	12
Bigeye chub	1	—	—	—	—	—	—	1
Emerald shiner	—	—	—	4	1	—	—	5
Silverside shiner	—	—	—	—	1	—	—	1
Silverstripe shiner	2	—	—	1	—	—	—	3
Blacktail shiner	1	2	7	—	5	10	4	29
Bullhead minnow	20	—	—	1	—	—	—	21
Quillback	—	—	—	—	15	2	—	17
Highfin carpsucker	—(2)	—	5	—	4	—	—	11
Smallmouth buffalo	—	3	1	—	—	—(1)	—	5
Spotted sucker	—(2)	—	—	—	—	—	—	2
River redhorse	—(2)	—	—	—(1)	—	—	—	3

(Continued)

* Catch is indicated separately for electroshocker and hoop nets, with hoop-net catch in parentheses.

Table 24 (Concluded)

Species	Number by Sampling Date							
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
Blacktail redhorse	2(7)	--	1	--(1)	1	--(1)	--	13
Blue catfish	--	1	--	--	--	--	--	1
Black bullhead	--(1)	--	--	--	--	--	--	1
Channel catfish	--(5)	2(1)	--(5)	--(5)	--	--	--	18
Flathead catfish	--	--	9	--	--(1)	--(2)	--	12
Atlantic needlefish	--	--	--	--	--	--	2	2
Blackstripe topminnow	--	--	--	--	1	--	--	1
Blackspotted topminnow	--	--	--	--	--	--	1	1
Mosquitofish	--	--	--	--	--	1	--	1
Rock bass	1	--	--	--	--	--	--	1
Green sunfish	1	--	--	--	--	--	--	1
Warmouth	--	--	--	--(1)	--	--	--	1
Orangespotted sunfish	1	--	--	--	--	--	--	1
Bluegill	13	1	1(11)		6(12)	5(23)	3	75
Longear sunfish	14	--	--	--	2	1	--	17
Redear sunfish	3	--	--	--	--	--(1)	--	4
Spotted bass	1	--	--	--	--	--	--	1
Largemouth bass	10	1	1	--	8	4	--	24
White crappie	26(1)	--	--	--(1)	7(9)	1(24)	--(2)	71
Black crappie	6	1	--	1(2)	4	--(21)	--(2)	37
Stizostedion sp.	--	1	--	--	--	--	--	1
Freshwater drum	--	2	--	--	--(1)	--(1)	--	4
Total number of individuals	126(20)	53(5)	57(16)	13(11)	137(23)	41(75)	10(4)	591
Number of species	25	11	13	11	20	17	6	42

Table 25

Species and Number of Fish Captured at the Within-Cut

Stations at Big Creek Bendway

Species	Number by Sampling Date*							
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
Spotted gar	--	2	1	--	2	--	--	5
Longnose gar	--	--	--(1)	--	--	--	--	1
Bowfin	--	1	--	--	1	--	--	2
American eel	--	--	--	--	--(1)	--	--(1)	2
Skipjack herring	--	--	--	--	--	1	--	1
Gizzard shad	5	19(25)	7	--	14	4	--	74
Threadfin shad	--	--	3	--	37	3	--	43
Mooneye	--	1	--	--	--	--	--	1
Carp	--	--	--	--	--	--(1)	--	1
Silvery minnow	1	--	--	--	1	3	--	5
Emerald shiner	--	1	--	3	26	--	--	30
Silverside shiner	--	--	--	--	4	--	--	4
Silverstripe shiner	1	--	--	--	2	--	--	3
Blacktail shiner	--	--	--	--	5	8	2	15
Bullhead minnow	--	2	--	--	2	--	--	4
Quillback	--	1	--	--(1)	25	--(1)	--	28
Highfin carpsucker	--	--	--(1)	--	4(3)	--	--	8
Creek chubsucker	--(1)	--	--	--	--	--	--	1
Smallmouth buffalo	--	1	--(1)	--	1	--	--	3

(Continued)

* Catch is indicated separately for electroshocker and hoop nets, with hoop-net catch in parentheses.

Table 25 (Concluded)

Species	Number by Sampling Date*							
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
Spotted sucker	--	1	--	--	--	--	--	1
River redhorse	--	--(1)	--	--	--	--	--	1
Blacktail redhorse	--	--	--	--(1)	--	--	--	1
Blue catfish	--	--(1)	--	--	--	--	--	1
Channel catfish	--	1(2)	--(4)	--(3)	--	--	--	10
Flathead catfish	--	--(2)	9	--	--(2)	--(1)	--(2)	16
Blackstripe topminnow	--	--	--	--	--	--	1	1
White bass	--	--	--	--(1)	--	--	--	1
Bluegill	6	4	--(2)	--(1)	1(5)	3(16)	--(1)	48
Longear sunfish	1	1	--	--	1	--(1)	--	4
Redear sunfish	--	--	--	--	--	--(1)	--	4
Largemouth bass	1	4	--	--	9	--	1	15
White crappie	21	5	--(12)	--	7(4)	--(14)	--(43)	106
Black crappie	2	1	--(5)	--(2)	--(14)	--(12)	--(39)	5
Freshwater drum	--	--(1)	--	--(1)	--(2)	--(1)	--	5
Total number of individuals	38(1)	45(32)	20(26)	3(10)	142(31)	22(48)	4(95)	517
Number of species	9	19	11	8	21	14	8	35

Table 26

Species and Number of Fish Captured at the Below-Bendway

Stations at Big Creek Bendway

Species	Number by Sampling Date*							
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
Spotted gar	—	—	—	—	17	1	—	18
Longnose gar	—	—	--(1)	—	—	—	—	1
American eel	—	—	—	—	--(3)	—	—	3
Bowfin	—	—	—	—	—	1		1
Skipjack herring	—	—	—	—	1	—	—	1
Gizzard shad	5	9	14	1	21	1	—	51
Threadfin shad	—	—	15	—	42	4	—	61
Mooneye	--(1)	—	—	—	—	—	—	1
Carp	—	—	—	—	1	1	—	2
Cypress minnow	1	—	—	—	—	—	—	1
Silvery minnow	—	1	—	—	—	1	—	2
Emerald shiner	—	—	—	2	9	—	—	11
Silverside shiner	—	—	—	1	2	—	—	3
Silverstripe shiner	2	—	—	—	1	—	—	3
Blacktail shiner	—	1	—	—	7	7	2	17
Bullhead minnow	—	1	—	—	—	—	—	1
Quillback	--(1)	—	—	—	20	—	—	21
Highfin carpsucker	—	—	1	—	—	—	—	1
Smallmouth buffalo	1	3	—	—	1	—	—	5
Spotted sucker	—	1	—	—	—	—	—	1

(Continued)

* Catch is indicated separately for electroshocker and hoop nets, with hoop-net catch in parentheses.

Table 26 (Concluded)

Species	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
	Number by Sampling Date							
Blacktail redhorse	--	1	--	--	--(1)	--	--	2
Blue catfish	--(2)	--	--	--	--	--	--	2
Channel catfish	--(6)	--(3)	1(2)	--	--	--	--	12
Flathead catfish	--	--(2)	3	--	--(1)	--(3)	--(2)	11
Atlantic needlefish	--	--	--	--	--	2	1	3
Blackstripe topminnow	--	--	--	--	--	1	--	1
Rock bass	--(1)	--(1)	--	--	--	--	--	2
Orangespotted sunfish	1	--	--	--	--	--	--	1
Bluegill	6	--	--(3)	--	1	3	1(1)	15
Longear sunfish	--	--	--	1	--	1	--	2
Redear sunfish	1	--	--	--	--	--	--	1
Spotted bass	--	--	--	--	--	1	--	1
Largemouth bass	4	--	1	--	1	6	1	13
White crappie	19	--	--	--	4(9)	--(6)	--(5)	43
Black crappie	2	--	--(7)	--	--	--(3)	--(14)	26
Freshwater drum	2	--(1)	--(1)	--	--	--	--(1)	5
Total number of individuals	44(11)	17(7)	35(14)	5	128(14)	30(12)	5(23)	345
Number of species	16	11	10	4	17	16	8	36

Table 27

Mean Values for Water-Quality Parameters Measured at the Surface (S) and Below the Surface (SS) at Hairston Bend

Parameter	Transect Location*	Dec 79		May 80		Jun 80		Jul 80 (1)		Jul 80 (2)		Aug 80 (1)		Aug 80 (2)		Sep 80	
		S	SS	S	SS	S	SS	S	SS	S	SS	S	SS	S	SS	S	SS
Current speed, m/sec	AB	—	—	0.33	0.63	0.27	0.20	0.02	0.00	0.07	0.07	0.00	0.00	0.00	0.02	0.10	0.00
	B	0.58	1.15	0.58	0.95	0.19	0.25	0.02	0.03	0.08	0.10	0.00	0.00	0.00	0.02	0.18	0.00
	BB	0.73	1.50	0.47	0.77	0.13	0.20	0.04	0.04	0.03	0.10	0.00	0.00	0.00	0.02	0.18	0.00
Temperature, °C	AB	6.7	6.0	17.7	17.5	26.4	26.1	28.4	28.3	28.1	28.2	29.7	29.7	31.2	30.7	29.0	
	B	6.7	6.7	17.6	17.6	26.6	26.5	28.7	28.8	28.6	28.6	30.0	29.9	30.9	30.7	29.2	29.1
	BB	6.7	6.8	17.7	17.5	27.0	26.7	28.9	28,9	28.5	28,6	30.2	30.0	31.3	30.4	29.0	29.2
Dissolved Oxygen, mg/ℓ	AB	9.6	9.6	7.2	7.4	9.2	8.9	6.4	6.1	5.3	4.9	6.0	—	7.3	4.7	5.4	5.1
	B	9.4	9.4	7.4	7.4	8.4	8.2	6.5	6.3	5.4	5.1	5.2	—	5.2	5.3	5.1	4.8
	BB	9.5	9.6	7.5	7.4	8.1	7.8	6.2	6.1	5.6	5.4	5.0	—	7.0	4.5	4.5	4.2
pH	AB	7.2	7.2	7.1	7.0	7.6	7.6	6.9	6.9	7.0	7.0	7.2	7.2	7.2	6.8	7.1	7.1
	B	7.3	7.3	7.1	7.1	7.4	7.4	7.1	7.0	7.0	6.9	7.2	7.1	7.5	7.3	6.9	6.7
	BB	7.3	7.3	7.1	7.0	7.4	7.2	7.2	7.1	7.0	7.0	7.2	7.1	7.4	7.2	6.8	6.8
Conductivity, μmhos/cm	AB	105	105	104	104	126	127	133	132	161	164	145	144	150	151	175	175
	B	108	106	106	105	125	125	136	137	133	133	143	143	148	151	179	179
	BB	105	107	106	106	123	123	145	145	136	134	148	150	148	152	181	182
Secchi Visibility, m	B	—	—	—	—	—	0.88	—	0.34	—	0.30	—	0.46	—	0.80	—	0.48
	C	—	0.33	—	0.27	—	0.82	—	0.34	—	0.29	—	0.44	—	0.72	—	0.43
Turbidity, NTU	B	—	—	—	—	—	—	38.3	38.2	42.2	42.5	10.6	10.8	7.8	7.3	—	—
	C	41.0	41.0	37.5	37.5	6.0	6.0	38.5	38.5	41.5	41.5	8.5	8.5	7.5	7.5	—	—
Carbon Dioxide, mg/ℓ	B	—	—	—	—	—	—	5.0	5.0	5.0	5.0	7.2	7.2	4.1	4.1	—	—
	C	4.5	4.5	2.2	2.2	6.0	6.0	4.5	4.5	6.5	6.5	8.0	8.0	5.2	5.2	—	—
Alkalinity, mg/ℓ	B	—	—	—	—	—	—	29.8	—	30.0	—	30.2	—	50.2	—	—	—
	C	30.0	—	30.5	—	38.0	—	27.0	—	33.0	—	30.5	—	53.0	—	—	—
Ammonia Nitrogen, mg/ℓ	B	—	—	—	—	—	—	0.07	0.07	0.78	0.78	0.01	0.01	33.4	22.29	—	—
	C	0.20	0.20	0.15	0.15	0.03	0.03	0.05	0.05	0.74	0.74	0.01	0.01	0.05	7.31	—	—
Total Phosphorus, mg/ℓ	B	—	—	—	—	—	—	0.28	0.28	0.37	0.37	0.49	0.49	0.04	0.04	—	—
	C	0.55	0.55	0.40	0.40	0.17	0.17	0.53	0.53	0.36	0.36	0.56	0.56	0.04	0.05	—	—
Orthophosphorus, mg/ℓ	B	—	—	—	—	—	—	0.17	0.17	0.14	0.14	0.19	0.19	0.03	0.05	—	—
	C	0.30	0.30	0.29	0.29	0.00	0.00	0.15	0.15	0.15	0.15	0.21	0.21	0.01	0.03	—	—

* Entries in this column denote transect locations:

- AB - above bendway
- B - within bendway
- BB - below bendway
- C - combined above and below bendway

Table 28

Total Catch of Macroinvertebrates Collected

in Hairston Bend

Family	Collection Date - Number of Individuals Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Jul 80	Total Collection
Worms:								
Tubificidae	20	32	159	27	143	188	119	688
Naididae	0	0	2	1	113	14	75	205
Mollusks:								
Sphaeriidae	1	0	16	0	2	9	3	31
Gastropods	0	0	1	2	7	3	45	58
Insects:								
Ephemeridae	49	0	17	2	2	27	3	100
Heptogeniidae	0	0	42	0	0	0	0	42
Caenidae	0	0	116	0	12	93	29	250
Gomphidae	3	2	6	1	2	3	2	19
Polycentropodidae	0	0	0	1	3	33	19	56
Leptoceridae	0	0	0	0	0	20	13	33
Hydropsychidae	2	21	1254	1	11	126	0	1415
Chaoboridae	12	5	7	1	14	27	84	150
Ceratopogonidae	0	3	4	2	13	36	63	121
Chironomidae	48	39	143	1	162	422	819	1643
Summary Statistics:								
Individuals:								
N	135	102	1767	39	484	1001	1274	4802
Total N	143	112	1793	49	502	1015	1303	4917
%	94.4	91.1	98.6	79.6	96.4	98.6	97.8	97.7
Families:								
N	7	6	12	10	12	13	12	14
Total N	12	12	19	16	22	21	19	35
%	58.3	50.0	63.2	62.5	54.6	62.9	63.2	40.0
Diversity:								
H'	2.37	2.48	1.68	2.67	2.56	2.70	2.11	2.80
$\bar{x}$ H'								2.37

Table 29

Indices of Similarity for Hairston Bend

Seasonal Collections

Procedure	Sampling Date	Comparison Date - Index: Mar 79	Aug 79	Dec 79	May 80	Jun 80	Jul 80
Jaccard Coefficient	Jan 79	33.3	40.9	47.4	36.0	37.5	40.9
	Mar 79		47.6	27.3	25.9	32.0	19.2
	Aug 79			40.0	41.4	48.1	40.7
	Dec 79				58.3	54.2	52.2
	May 80					72.0	64.0
	Jun 80						48.1
Morisita Index	Jan 79	0.67	0.14	0.36	0.62	0.73	0.69
	Mar 79		0.50	0.63	0.85	0.95	0.77
	Aug 79			0.16	0.18	0.38	0.13
	Dec 79				0.63	0.83	0.19
	May 80					0.83	0.75
	Jun 80						0.88

Table 30

Species and Relative Abundance of Fish Captured at Mairston Bend by Sampling Date and Gear*

Species	Jan 79 % ES	Jan 79 % HN	Jan 79 % MT	Jan 79 % TL	Mar 79 % ES	Mar 79 % HN	Mar 79 % MT	Mar 79 % TL	Aug 79 % ES	Aug 79 % HN	Aug 79 % MT	Aug 79 % TL	Dec 79 % ES	Dec 79 % HN	Dec 79 % MT	Dec 79 % S	Dec 79 % TL	May 80 % ES	May 80 % HN	May 80 % S	May 80 % TL	Jan 80 % ES	Jan 80 % HN	Jan 80 % S	Jan 80 % TL	Aug 80 % ES	Aug 80 % HN	Aug 80 % S	Aug 80 % TL	Sample Periods Combined %
Chestnut lamprey	—	—	—	—	1.2	—	—	0.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Spotted gar	0.3	—	—	0.3	—	—	—	—	4.4	2.3	—	1.4	9.4	—	—	—	0.7	14.1	—	—	5.5	0.6	—	—	0.4	—	—	—	—	1.1
Longnose gar	0.6	—	—	0.6	14.6	—	—	9.9	—	6.8	—	0.7	9.4	—	—	—	0.7	9.4	1.6	—	4.1	0.3	—	2.1	0.4	1.9	—	—	0.4	1.4
Bowfin	1.2	—	—	1.2	—	—	—	—	0.9	—	—	0.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.2
American eel	—	5.3	—	0.3	—	2.6	—	0.8	—	—	—	—	—	3.2	—	—	0.2	—	8.1	—	2.3	—	3.0	—	0.6	—	0.9	—	0.4	0.5
Gizzard shad	14.0	—	—	11.2	7.3	—	—	5.0	4.4	4.5	—	1.7	15.6	6.5	—	—	1.7	15.3	—	—	5.9	5.3	—	—	3.6	15.4	0.9	0.8	3.5	4.6
Threadfin shad	—	—	—	—	—	—	—	—	—	—	24.8	15.4	—	—	—	0.3	0.2	20.0	—	—	7.8	1.9	—	—	1.3	26.9	—	—	4.9	4.5
Mooneye	0.3	—	—	0.3	7.3	—	—	5.0	0.9	2.3	—	0.5	—	—	—	—	—	—	—	—	—	0.3	—	—	0.2	—	—	—	—	0.4
Redfin pickerel	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.2	—	—	0.5	—	—	—	—	—	—	—	—	0.04
Chain pickerel	0.3	—	—	0.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Stoneroller	—	—	—	—	—	—	—	—	—	—	—	—	—	3.2	—	—	0.2	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Carp	1.2	—	—	1.2	—	5.1	—	1.7	0.9	—	—	0.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.3
Cypress minnow	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.3	0.2	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Silvery minnow	40.8	—	—	38.5	13.4	—	—	9.1	32.5	—	—	8.9	18.8	—	—	17.1	15.9	1.2	—	—	0.5	—	—	20.8	2.1	—	—	30.4	13.3	13.0
Bigeye chub	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Speckled chub	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.3	0.2	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Emerald shiner	0.3	—	—	0.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Pretty shiner	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.8	0.7	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Ironcolor shiner	—	—	—	—	—	—	—	—	—	—	0.4	0.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Fluvial shiner	0.9	—	—	0.9	—	—	—	—	—	—	—	—	—	—	—	3.4	2.9	—	—	18.1	5.5	—	—	—	—	—	—	0.8	0.4	1.3
Pugnose minnow	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.3	0.2	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Silverstripe shiner	2.2	—	—	2.1	3.7	—	—	2.5	5.3	—	—	1.4	3.1	—	—	7.3	6.4	—	—	—	—	30.7	—	—	21.0	—	—	—	—	6.2
Weed shiner	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.3	0.2	—	—	—	—	—	—	—	—	—	—	1.6	0.7	0.1
Blacktail shiner	2.5	—	—	2.4	2.4	—	—	1.7	10.5	—	58.5	39.2	34.4	—	—	25.2	24.0	18.8	—	50.0	23.7	45.8	—	62.5	37.1	32.7	—	18.4	14.0	23.9
Mimic shiner	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.6	3.1	—	—	1.4	0.5	—	—	—	—	—	—	—	—	0.6
Bullhead minnow	5.6	—	—	5.3	1.2	—	—	0.8	—	—	7.4	4.6	—	—	—	20.7	17.6	2.4	—	26.4	9.6	—	—	4.2	0.4	—	—	21.6	9.5	7.2
Quillback	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.1	1.0	4.7	—	—	1.8	—	—	—	—	—	—	—	—	0.4
Highfin carpsucker	1.5	—	—	1.8	8.5	—	—	5.8	8.6	2.3	2.0	3.8	—	3.2	—	—	0.2	4.7	1.6	—	2.3	2.8	—	—	1.9	—	—	—	—	2.0
Smallmouth buffalo	1.2	—	—	1.2	7.3	—	—	5.0	4.4	4.5	1.6	2.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.9
Spotted sucker	—	—	—	—	—	—	—	—	—	—	—	—	—	3.2	—	—	0.2	—	—	—	—	—	—	—	—	—	—	—	—	0.04
River redhorse	—	—	—	—	—	—	—	—	—	—	—	—	—	6.5	—	—	0.5	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Black redhorse	—	—	—	—	—	2.6	—	0.8	—	—	0.4	0.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.1
Golden redhorse	—	5.3	—	0.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Blacktail redhorse	0.6	26.3	—	2.1	—	—	—	—	—	—	—	—	3.1	16.1	—	—	1.4	—	1.6	—	0.5	—	—	—	—	—	—	—	—	0.6
Blue catfish	—	10.5	—	0.6	—	—	—	—	—	2.3	—	0.2	—	3.2	—	—	0.2	—	—	—	—	—	—	—	—	—	0.9	—	0.4	0.2
Channel catfish	1.2	47.4	—	3.8	3.7	64.1	—	23.1	3.5	29.5	0.4	4.3	—	48.4	—	—	3.6	—	6.5	—	1.8	—	11.0	—	2.4	—	0.9	—	0.4	4.0
Flathead catfish	—	—	—	—	—	15.4	—	5.0	14.0	22.3	3.1	8.7	—	3.2	—	—	0.2	—	9.7	—	2.7	0.9	8.0	—	2.4	—	1.9	—	0.7	2.7
Atlantic needlefish	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.9	—	—	0.4	0.04
Blackstripe topminnow	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.9	—	—	0.4	0.04
Blackspotted topminnow	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.9	—	—	0.4	0.04
Mosquitofish	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.3	0.2	2.4	—	1.4	1.4	—	—	2.1	0.2	—	—	5.6	2.5	0.5
Brook silverside	0.3	—	—	0.3	—	—	—	—	—	—	—	—	—	—	—	0.3	0.2	—	—	—	—	0.3	—	—	0.2	—	—	—	—	0.1
Rock bass	—	5.3	—	0.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.6	—	0.5	—	—	—	—	—	—	—	—	0.1
Green sunfish	—	—	—	—	—	—	—	—	—	—	0.4	0.2	—	—	100.0	—	0.2	1.2	1.6	—	0.9	—	—	—	—	—	—	—	—	0.2
Warmouth	0.6	—	—	0.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.3	1.0	—	0.4	—	—	—	—	0.2
Orangespotted sunfish	0.3	—	—	0.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Bluegill	8.1	—	—	7.6	—	2.6	—	0.8	—	2.3	—	0.2	—	—	—	4.8	4.0	1.2	22.6	—	6.8	3.1	31.0	—	8.8	11.5	32.4	—	14.4	6.3
Longear sunfish	1.6	—	—	1.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6.5	—	1.8	0.3	6.0	—	1.5	—	1.9	0.8	1.1	0.8
Redear sunfish	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.2	—	—	0.5	—	1.0	—	0.2	—	—	—	—	0.1
Spotted bass	0.3	—	—	0.3	—	—	—	—	—	—	0.4	0.2	—	—	—	—	—	—	—	—	—	—	—	2.1	0.2	—	—	0.8	0.4	0.2
Largemouth bass	0.3	—	—	0.3	1.2	—	—	0.8	1.8	—	0.4	0.7	—	—	—	—	—	—	—	—	—	2.2	—	2.1	1.7	3.8	—	—	0.7	0.7
White crappie	4.0	—	—	3.8	—	—	—	—	—	6.8	—	0.7	3.1	—	—	—	0.2	1.2	16.1	—	5.0	—	7.0	—	1.5	—	34.3	—	13.0	3.2
Black crappie	0.3	—	—	0.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17.7	—	5.0	—	31.0	—	6.6	—	25.9	—	9.8	3.1
Crystal darter	—	—	—	—	—	—	—	—	0.9	—	—	0.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Southern sand darter	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.4	0.5	—	—	—	—	—	—	1.6	0.7	0.1
Logperch	—	—	—	—	—	2.6	—	0.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04
Dusky darter	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.8	0.4	0.04
Freshwater drum	8.7	—	—	8.2	28.0	5.1	—	20.7	7.0	6.8	0.4	2.9	—	—	—	—	—	1.2	4.8	—	1.8	0.3	1.0	—	0.4	—	—	—	—	3.1
Bluntnose minnow	—	—	—	—	—	—	—	—	—	—	—	—	3.1	—	—	0.6	0.7	—	—	—	—	—	—	—	—	—	—	16.8	7.4	1.1
Unidentified to species										2.3		0.2		3.2		13.4	11.6	—	—	1.4	0.5	4.7	—	4.2	3.6	1.9	—	—	0.4	3.04
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* Gear types are identified in column headings as follows:
- ES – electroshocker
- HN – hoop net
- MT – minnow trap
- TL – total for all gear types

Table 31

Species and Number of Fish Captured at the Above-Bendway Stations at Hairston Bend

Species	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
	Number by Sampling Date*							
Spotted gar	—	—	1(1)	—	11	1	—	14
Longnose gar	—	7	—	—	5(1)	—	—	13
Bowfin	2	—	1	—	—	—	—	3
Gizzard shad	20	—	2	—	3	—	2	27
Threadfin shad	—	—	—	—	8	—	3	11
Mooneye	—	3	—	—	—	—	—	3
Carp	1	—(1)	1	—	—	—	—	3
Silvery minnow	23	—	—	2	—	—	—	25
Emerald shiner	1	—	—	—	—	—	—	1
Fluvial shiner	3	—	—	—	—	—	—	3
Silverstripe shiner	4	3	6	—	—	—	—	13
Blacktail shiner	4	1	6	—	3	21	2	37
Bullhead minnow	14	—	—	—	1	—	—	15
Quillback	—	—	—	—	2	—	—	2
Highfin carpsucker	4	4	4	—	—	1	—	13
Smallmouth buffalo	—	1	2	—	—	—	—	3
Black redhorse	—	—(1)	—	—	—	—	—	1
Golden redhorse	—(1)	—	—	—	—	—	—	1
Blacktail redhorse	1(1)	—	—	—	—	—	—	2

(Continued)

* Catch is indicated separately for electroshocker and hoop nets, with hoop-net catch in parentheses.

Table 31 (concluded)

Species	Number by Sampling Date							
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
Blue catfish	--(2)	--	--	--(1)	--	--	--	3
Channel catfish	--(3)	1(7)	1	--(1)	--(1)	--	--	14
Flathead catfish	--	--	2	--(1)	--(1)	--	--	4
Mosquitofish	--	--	--	--	1	--	--	1
Brook silverside	1	--	--	--	--	--	--	1
Green sunfish	--	--	--	--	--(1)	--	--	1
Warmouth	2	--	--	--	--	--	--	2
Orangespotted sunfish	1	--	--	--	--	--	--	1
Bluegill	25	--	--	--	--(10)	1(1)	1	38
Longear sunfish	1	--	--	--	--(2)	--	--	3
Spotted bass	1	--	--	--	--	--	--	1
Largemouth bass	1	--	--	--	--	--	--	1
White crappie	11	--	--(3)	1	1(6)	--	--(2)	24
Black crappie	--	--	--	--	--(6)	--	--	6
Freshwater drum	--	1	3	--	--(1)	1	--	6
Total number of individuals	120(7)	21(9)	29(4)	3(3)	35(29)	25(1)	8(2)	296
Number of species	22	10	12	5	16	5	5	35

Table 32

Species and Number of Fish Captured at the Within-Bendway Stations at Hairston Bend

	Number by Sampling Date*							
Species	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
Spotted gar	—	—	4	3	1	1	—	9
Longnose gar	2	1	—(3)	3	3	1	1	14
American eel	—	—	—	—(1)	—(5)	—(2)	—(1)	9
Gizzard shad	18	—	3(1)	4	2	8	3(1)	40
Threadfin shad	—	—	—	—	7	2	11	20
Mooneye	1	3	—(1)	—	—	1	—	6
Redfin pickerel	—	—	—	—	1	—	—	1
Chain pickerel	1	—	—	—	—	—	—	1
Stoneroller	—	—	—	—(1)	—	—	—	1
Carp	1	—(1)	—	—	—	—	—	2
Silvery minnow	103	11	—	—	1	—	—	115
Silverstripe shiner	3	—	—	1	—	29	—	33
Blacktail shiner	4	1	3	1	9	109	13	140
Bullhead minnow	2	1	—	—	1	—	—	4
Quillback	—	—	—	—	2	—	—	2
Highfin carpsucker	2	3	5(1)	—(1)	4	4	—	20
Smallmouth buffalo	2	2	1(1)	—	—	—	—	6
Spotted sucker	—	—	—	—(1)	—	—	—	1
Blacktail redhorse	1	—	—	—(3)	—(1)	—	—	5

(Continued)

* Catch is indicated separately for electroshocker and hoop nets, with hoop-net catch in parentheses.

Table 32 (Concluded)

Species	Number by Sampling Date							Total
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	
Blue catfish	--	--	--(1)	--	--	--	--	1
Channel catfish	3(1)	2(6)	3(6)	--(11)	--(3)	--(9)	--	44
Flathead catfish	--	--(3)	11(8)	--	--(5)	3(7)	--(2)	39
Atlantic needlefish	--	--	--	--	--	--	1	1
Blackstripe topminnow	--	--	--	--	--	--	1	1
Mosquitofish	--	--	--	--	1	--	--	1
Brook silversides	--	--	--	--	--	1	--	1
Rock bass	--	--	--	--	--(1)	--	--	1
Green sunfish	--	--	--	--(1)	--	--	--	1
Bluegill	1	--(1)	--(1)	--	1(4)	4(16)	2(18)	48
Longear sunfish	4	--	--	--	--(2)	1(4)	--(1)	12
Redear sunfish	--	--	--	--	1	--	--	1
Largemouth bass	--	1	1	--	--	2	2	6
White crappie	1	--	--	--	--(4)	--(6)	--(30)	41
Black crappie	1	--	--	--	--(5)	--(26)	--(19)	51
Crystal darter	--	--	1	--	--	--	--	1
Logperch	--	--(1)	--	--	--	--	--	1
Stizostedion sp.	--	--	--	--(1)	--	--	--	1
Freshwater drum	22	19	3(3)	--	1(1)	--(1)	--	50
Total number of individuals	172(1)	44(12)	35(26)	12(20)	35(31)	166(71)	34(72)	731
Number of species	18	14	15	13	22	18	13	39

Table 33

Species and Number of Fish Captured at the Below-Bendway Stations at Hairston Bend

Species	Number by Sampling Date*							
	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
Longnose gar	--	3	--	--	--	--	--	3
Bowfin	1	--	--	--	--	--	--	1
American eel	--(1)	--(1)	--	--	--	--(1)	--	3
Gizzard shad	4	--	--	1(2)	8	9	3	27
Threadfin shad	--	--	--	--	2	4	--	6
Mooneye	--	--	1	--	--	--	--	1
Carp	1	--	--	--	--	--	--	1
Silvery minnow	3	--	37	4	--	--	--	44
Silverstripe shiner	--	--	--	--	--	4	--	4
Blacktail shiner	--	--	3	10	4	16	2	35
Bluntnose minnow	--	--	--	1	--	--	--	1
Bullhead minnow	1	--	--	--	--	--	--	1
Highfin carpsucker	--	--	2	--	--(1)	4	--	7
Smallmouth buffalo	2	--	2(1)	--	--	--	--	5
River redhorse	--	--	--	--(2)	--	--	--	2
Blacktail redhorse	--(4)	--	--	1(2)	--	--	--	7
Blue catfish	--	--	--	--	--	--	--(1)	1
Channel catfish	--(5)	--(12)	--(7)	--(3)	--	--(2)	--(1)	30
Flathead catfish	--	--(3)	3(4)	--	--	--(1)	--	11
Blackspotted topminnow	--	--	--	--	--	--	1	1

(Continued)

* Catch is indicated separately for electroshocker and hoop nets, with hoop-net catch in parentheses.

Table 33 (Concluded)

Species	Jan 79	Mar 79	Aug 79	Dec 79	May 80	Jun 80	Aug 80	Total
	Number by Sampling Date							
Rock bass	--(1)	--	--	--	--	--	--	1
Green sunfish	--	--	--	--	1	--	--	1
Warmouth	--	--	--	--	--	1(1)	--	2
Bluegill	--	--	--	--	--	5(14)	3(17)	39
Longear sunfish	--	--	--	--	--	--(2)	--(1)	3
Redear sunfish	--	--	--	--	--	--(1)	--	1
Largemouth bass	--	--	1	--	--	5	--	6
White crappie	--	--	--	--	--	--(1)	--(5)	6
Black crappie	--	--	--	--	--	--(1)	--(5)	6
Freshwater drum	6	2(2)	2	--	--(1)	--	--	13
Total number of individuals	18(11)	5(18)	51(12)	17(9)	15(2)	48(24)	9(34)	272
Number of species	11	5	9	7	6	15	9	30

Table 34

Macroinvertebrate Taxa Collected from Tombigbee River

Annelida:	**Plecoptera:**
Tubificidae	Perlidae
Naididae	Perlodidae
Enchytraeidae	**Trichoptera:**
Haplotaxidae	Polycentropodidae
Glossoscolecidae	Leptoceridae
Lumbricidae	Hydropsychidae
Lumbriculidae	Phryganeidae
Mollusca:	Hydroptilidae
Corbiculidae	**Megaloptera:**
Sphaeriidae	Sialidae
Pleuroceridae	**Hemiptera:**
Unionidae	Corixidae
Viviparidae	Hebridae
Physidae	Hemiptera*
Planorbidae	**Coleoptera:**
Lymnacidae	Elimidae
Bulimidae	Hydrophilidae
Bithyniidae	Chrysomelidae
Pelecypode	Dytiscidae
Gastropoda	Heteroceridae
Crustacea:	**Diptera:**
Talitridae	Chaoboridae
Asellidae	Tipulidae
Gammaridae	Ceratopogonidae
Palaemonidae	Rhagionidae
Cypridae	Simuliidae
Ephemeroptera:	Psychodidae
Ephemeridae	Anthomyiidae
Heptageniidae	Tabanidae
Caenidae	Chironomidae
Siphlonuridae	Diptera*
Polymitarcyidae	
Odonata:	
Coenagrionidae	
Libellulidae	
Macromiidae	
Gomphidae	
Zygoptera	

* Distinct taxa not identified to family.

Table 35

Dominant Macroinvertebrate Families Collected at each Location

Family*	Bendway** Rattlesnake %	Cooks %	Big Creek %	Hairston %
Tubificidae	13.6	24.5	30.8	14.0
Naididae	0.3	2.8	2.0	4.2
Sphaeriidae	4.0	1.6	0.4	0.6
Ephemeridae	22.2	5.2	7.4	2.0
Caenidae	0.2	0.7	0.4	5.1
Hydropsychidae	0.2	0.1	1.1	28.8
Chaoboridae	22.9	21.2	25.0	3.1
Ceratopogonidae	4.0	1.5	1.7	2.5
Chironomidae	27.6	38.2	28.4	33.2
% Total Collection	95.0	95.8	97.2	93.5

* Includes families that accounted for 2.2% (minimum) or more of a bendway collection.

** Percentages represent the percent occurrence within each bendway collection.

Table 36

Common Macroinvertebrate Families Collected at Each Location

Family*	Bendway** Rattlesnake %	Cooks %	Big Creek %	Hairston %
Enchytraeidae	0.00	0.02	0.04	0.08
Glossoscolecidae	0.09	--	0.07	--
Lumbriculidae	0.07	0.40	0.01	0.16
Pelecypoda (unidentified)	0.94	0.38	0.16	0.33
Pleuroceridae	0.11	--	--	0.06
Unionidae	0.18	0.20	--	--
Gastropoda (unidentified)	1.11	0.09	0.03	1.18
Viviparidae	0.05	--	--	--
Bulimidae	0.05	--	--	--
Talitridae	0.09	0.05	0.03	--
Asellidae	--	0.07	0.03	--
Gammaridae	0.05	0.04	0.25	0.08
Cypridae	0.05	--	--	--
Heptageniidae	--	--	0.21	0.85
Coenagrionidae	0.04	0.13	0.05	0.04
Macromiidae	--	0.20	0.03	0.02
Gomphidae	0.14	0.18	0.16	0.39
Perlidae	--	--	0.03	0.10
Polycentropodidae	0.58	0.65	0.22	1.14
Leptoceridae	0.28	1.06	0.05	0.67
Hydroptilidae	--	0.07	--	--
Sialidae	0.60	0.04	0.01	0.08
Corixidae	0.02	0.02	0.20	0.20
Elmidae	0.21	0.20	0.99	0.10
Dytiscidae	0.04	0.05	0.01	0.08
Heteroceridae	--	0.02	0.03	0.16
Diptera (unidentified)	0.09	0.05	0.05	0.37
Simuliidae	0.04	--	0.01	0.28
% of total collection	4.83	3.92	2.67	6.37
% dominant and common	99.83	99.72	99.87	99.87

* Includes families that accounted for 0.1 to 1.2 percent (maximum) of a bendway collection.

** Percentages represent the percent occurrence within each bendway collection.

Table 37

Rare Macroinvertebrate Families Collected at Each Location

	Bendway**			
Family*	Rattlesnake %	Cooks %	Big Creek %	Hairston %
Haplotaxidae	0.02	--	0.01	--
Lumbricidae	--	0.04	0.04	0.04
Corbiculidae	0.02	--	0.01	--
Physidae	0.02	0.07	--	--
Planorbidae	--	0.04	--	0.02
Lymnaeidae	0.02	0.02	--	--
Bithyniidae	0.02	--	--	--
Palaemonidae	--	0.02	--	--
Siphlonuridae	--	--	0.01	0.04
Polymitarcidae	--	--	0.03	0.04
Zygoptera (unidentified)	0.02	--	--	--
Libellulidae	0.02	--	0.01	--
Perlodidae	--	--	0.01	0.02
Phryganeidae	--	0.02	--	--
Hemiptera (unidentified)	0.02	--	--	--
Hebridae	--	0.04	--	--
Hydrophilidae	--	0.04	--	--
Chrysomelidae	--	0.02	--	--
Tipulidae	--	--	0.03	--
Rhagionidae	--	--	0.01	--
Psychodidae	--	--	0.01	--
Anthomyiidae	--	--	0.01	0.02
Tabanidae	--	0.02	0.01	--
% of Collection	0.16	0.29	0.20	0.18

* Includes families that accounted for less than 0.1 percent (maximum) of a bendway collection.

** Percentages represent the percent occurrence within each bendway collection.

Table 38

Bivalve Mollusks Collected in Bendways on the Tombigbee River, Alabama, 2-3 September 1980

Scientific Name	Common Name	Rattlesnake Bend	Cooks Bend	Big Creek Bendway
Amblema costata	Three-ridge	--	--	X[a,b]
Corbicula sp.	Asian clam	--	X[d]	--
Elliptio crassidens	Elephant's ear	--	--	X[b]
Fusconaia ebena	--	--	--	X[a,b,c]
Lampsilis anodontoides	Yellow sand-shell	--	--	X[a]
Leptodea fragilis	Fragile paper shell	--	X[d]	X[a]
Megalonaias gigantea	Washboard	--	--	X[a,b,c]
Obliquaria reflexa	Three-horned warty-back	--	--	X[a]
Phagiola lineolata	Butterfly	--	--	X[c]
Plectomerus dombeyanus	--	--	--	X[a,b]
Pleurobema marshalli	Marshall's mussel	--	--	X[c]
Pleurobema taitianum	Judge Tait's mussel	--	--	X[c]
Proptera purpurata	--	--	--	X[a,b]
Quadrula metanevra	Monkey-face	--	--	X[a,c]
Quadrula pustulosa	Pimple back	--	--	X[a,b,c]
Quadrula quadrula	Maple-leaf	X[e]	--	X[a]
Quadrula sp.	--	--	--	X[b]
Tritogonia verrucosa	Pistol-grip	--	--	X[b]

[a]Hand collected on sand bar on left bank of the river below transect 120.

[b]Hand collected on sand bar on right bank of the river above transect 110.

[c]Hand collected on sand bar on left bank of the bendway below transect 680.

[d]Hand collected on sand bar on right bank of river below transect 120.

[e]Collected by brailling near transect 220.

Table 39

Families and Species of Fish Captured During 1979-1980

Petromyzontidae - lampreys
- Chestnut lamprey (*Ichthyomyzon castaneus*)
- Southern brook lamprey (*Ichthyomyzon gagei*)

Lepisosteidae - gars
- Spotted gar (*Lepisosteus oculatus*)
- Longnose gar (*Lepisosteus osseus*)
- Alligator gar (*Lepisosteus spatula*)

Amiidae - bowfins
- Bowfin (*Amia calva*)

Anguillidae - freshwater eels
- American eel (*Anguilla rostrata*)

Clupeidae - herrings
- Alabama shad (*Alosa alabamae*)
- Skipjack herring (*Alosa chrysochloris*)
- Gizzard shad (*Dorosoma cepedianum*)
- Threadfin shad (*Dorosoma petenense*)

Hiodontidae - mooneyes
- Mooneye (*Hiodon tergisus*)

Esocidae - pikes
- Redfin pickerel (*Esox americanus americanus*)
- Chain pickerel (*Esox niger*)

Cyprinidae - minnows and carps
- Stoneroller (*Campostoma anomalum*)
- Carp (*Cyprinus carpio*)
- Cypress minnow (*Hybognathus hayi*)
- Silvery minnow (*Hybognathus nuchalis*)
- Bigeye chub (*Hybopsis amblops*)
- Speckled chub (*Hybopsis aestivalis*)
- Silver chub (*Hybopsis storeriana*)
- Golden shiner (*Notemigonus crysoleucas*)
- Emerald shiner (*Notropis atherinoides*)
- Pretty shiner (*Notropis bellus*)
- River shiner (*Notropis blennius*)
- Silverside shiner (*Notropis candidus*)
- Ironcolor shiner (*Notropis chalybaeus*)
- Fluvial shiner (*Notropis edwardraneyi*)
- Silverband shiner (*Notropis shumardi*)
- Silverstripe shiner (*Notropis stilbius*)
- Weed shiner (*Notropis texanus*)
- Blacktail shiner (*Notropis venustus*)
- Mimic shiner (*Notropis volucellus*)
- Bluntnose minnow (*Pimephales notatus*)
- Bullhead minnow (*Pimephales vigilax*)

(Continued)

(Sheet 1 of 3)

Table 39 (Continued)

Catostomidae - suckers
- Quillback (*Carpiodes cyprinus*)
- Highfin carpsucker (*Carpiodes velifer*)
- Creek chubsucker (*Erimyzon oblongus*)
- Smallmouth buffalo (*Ictiobus bubalus*)
- Spotted sucker (*Minytrema melanops*)
- River redhorse (*Moxostoma carinatum*)
- Black redhorse (*Moxostoma duquesnei*)
- Golden redhorse (*Moxostoma erythrurum*)
- Blacktail redhorse (*Moxostoma poecilurum*)

Ictaluridae - freshwater catfishes
- Blue catfish (*Ictalurus furcatus*)
- Black bullhead (*Ictalurus melas*)
- Brown bullhead (*Ictalurus nebulosus*)
- Channel catfish (*Ictalurus punctatus*)
- Flathead catfish (*Pylodictis olivaris*)

Apredoderidae - pirate perches
- Pirate perch (*Aphredoderus sayanus*)

Belonidae - needlefishes
- Atlantic needlefish (*Strongylura marina*)

Cyprinodontidae - killifishes
- Blackstripe topminnow (*Fundulus notatus*)
- Blackspotted topminnow (*Fundulus olivaceus*)

Poeciliidae - livebearers
- Mosquitofish (*Gambusia affinis*)

Atherinidae - silversides
- Brook silverside (*Labidesthes sicculus*)

Percichthyidae - temperate basses
- White bass (*Morone chrysops*)

Centrarchidae - sunfishes
- Rock bass (*Ambloplites rupestris*)
- Flier (*Centrarchus macropterus*)
- Green sunfish (*Lepomis cyanellus*)
- Warmouth (*Lepomis gulosus*)
- Orangespotted sunfish (*Lepomis humilis*)
- Bluegill (*Lepomis macrochirus*)
- Longear sunfish (*Lepomis megalotis*)
- Redear sunfish (*Lepomis microlophus*)
- Spotted sunfish (*Lepomis punctatus*)
- Spotted bass (*Micropterus punctulatus*)
- Largemouth bass (*Micropterus salmoides*)
- White crappie (*Pomoxis annularis*)
- Black crappie (*Pomoxis nigromaculatus*)

(Continued)

Table 39 (Concluded)

Percidae - perches	
	Crystal darter (*Ammocrypta asprella*)
	Southern sand darter (*Ammocrypta meridiana*)
	Swamp darter (*Etheostoma fusiforme*)
	Logperch (*Percina caprodes*)
	Dusky darter (*Percina sciera*)
	Perch (*Stizostedion* sp.)
Sciaenidae - drums	
	Freshwater drum (*Aplodinotus grunniens*)
Mugilidae - mullets	
	Striped mullet (*Mugil cephalus*)

Table 40

Similarity Values For Paired Combinations of Bendways

Sample Date	Bendway Pair* - Similarity Value						Mean for Sampling Date
	RB/HB	CB/BC	HB/CB	BC/HB	RB/BC	RB/CB	
January 1979	0.63	1.00	0.86	1.35	0.47	0.80	0.85
March 1979	0.44	0.65	0.46	0.94	0.95	1.00	0.74
August 1979	0.83	1.08	0.93	1.67	1.42	1.56	1.25
December 1979	0.37	0.94	0.48	0.48	0.74	1.15	0.69
May 1980	0.94	1.92	0.89	1.71	1.64	1.50	1.43
June 1980	0.88	1.24	1.46	1.31	1.13	1.55	1.26
August 1980	0.68	0.78	0.81	0.93	0.63	1.21	0.84
Mean	0.68	1.09	0.84	1.20	1.00	1.25	
Standard deviation	0.22	0.41	0.33	0.44	0.43	0.30	

Table 41

Bray-Curtis Dissimilarity Indices for Paired Combinations of Bendways

Sample Date	Bendway Pair - Index Value*					
	RB/HB	RB/CB	RB/BC	CB/BC	CB/HB	BC/HB
January 1979	0.84	0.77	0.54	0.84	0.76	0.56
March 1979	0.83	0.63	0.67	0.55	0.85	0.84
August 1979	0.84	0.72	0.73	0.37	0.66	0.56
December 1979	0.88	0.57	0.73	0.69	0.83	0.70
May 1980	0.78	0.59	0.55	0.68	0.74	0.77
June 1980	0.72	0.37	0.53	0.53	0.63	0.67
August 1980	0.80	0.65	0.80	0.66	0.58	0.51
Mean	0.81	0.61	0.65	0.62	0.72	0.66
Standard deviation	0.05	0.13	0.11	0.15	0.10	0.12

* RB - Rattlesnake Bend
Hb - Hairston Bend
CB - Cooks Bend
BC - Big Creek Bendway

Table 42

Diversity Values for Bendways During Seven Sampling Periods

Sample Date	Bendway-Diversity Value			
	Rattlesnake	Cooks	Big Creek	Hairston
January 1979	2.10	2.64	2.75	2.32
March 1979	2.36	2.16	1.98	2.38
August 1979	0.98	1.55	2.07	2.18
December 1979	2.30	2.56	2.49	2.39
May 1980	1.66	1.95	2.34	2.74
June 1980	2.06	2.39	2.44	2.13
August 1980	1.36	2.40	1.89	2.49
Mean	1.83	2.26	2.28	2.38
Standard deviation	0.52	0.38	0.31	0.20

Table 43

Percentage Composition by Fish Ecological Group

Bendway	Ecological Group-%				
	Sport Fish	Sport/Commercial	Shad	Minnows/ Shiners	Suckers
Hairston	14.9	10.0	9.1	52.6	4.1
Big Creek	25.4	3.5	36.8	21.9	5.8
Cooks	36.5	3.4	28.2	26.9	1.1
Rattlesnake	26.2	8.4	39.8	22.6	1.0

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

A study of cutoff bendways on the Tombigbee River / by C.H. Pennington ... [et al] (Environmental Laboratory, U.S. Army Engineer Waterways Experiment Station). -- Vicksburg, Miss. : The Station : Springfield, Va. : available from NTIS, 1981.
78, [61] p. : ill. ; 27 cm. -- (Technical report / U.S. Army Engineer Waterways Experiment Station ; E-81-14)
Cover title.
"November 1981."
Final report.
"Prepared for Office, Chief of Engineers, U.S. Army under EWQOS Work Unit VIIB."
At head of title: Environmental and Water Quality Operational Studies.
Bibliography: p. 74-78.

Aquatic ecology. 2. River channels. 3. Tombigbee River (Miss. and Ala.) 4. Water quality. I. Pennington, C.H. II. United States. Army. Corps of Engineers.

A study of [illegible]ff bendways on the Tombigbee River : ... 1981.
(Card 2)

Office of the Chief of Engineers. III. Environmental and Water Quality Operational Studies. IV. U.S. Army Engineer Waterways Experiment Station. Environmental Laboratory. V. Series: Technical report (U.S. Army Engineer Water[illegible]ays Experiment Station) ; E-81-14.
TA7.W34 no.E[illegible]